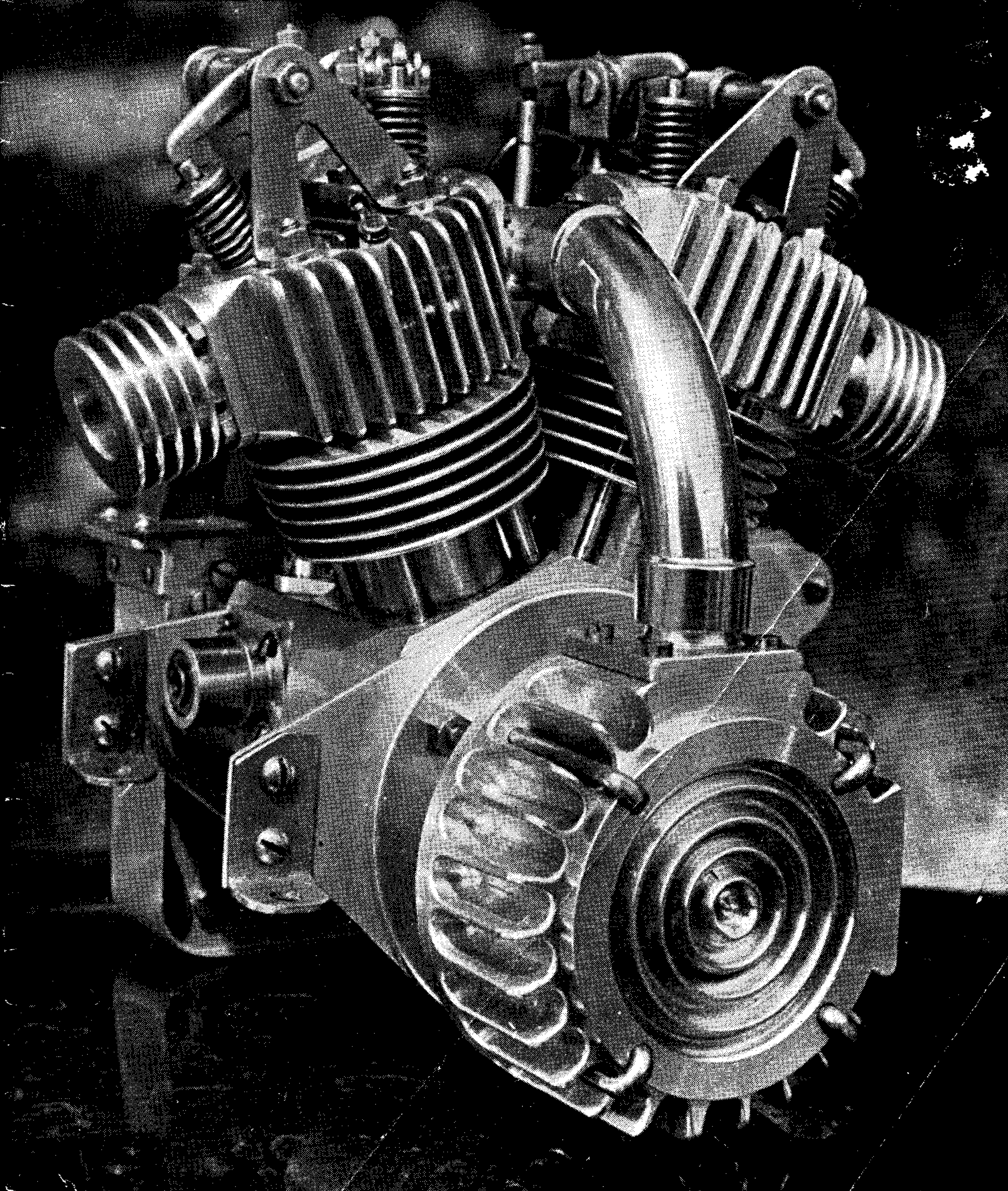
Vol. 105 No. 2625 THURSDAY SEPT 13 1951 9d.

THE MODEL ENGINEER



The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

13TH SEPTEMBER 1951 VOL. 105 NO. 2625

SMOKE RINGS

Our Cover Picture

● THE ENGINE shown here was constructed by Mr. B. Stalham, of Kings Lynn, and was "discovered" by our photographer at the St. Albans regatta where this photograph was taken. It is of the vee-twin type with inclined overhead valves, and is equipped with a flywheel magneto and vane-type supercharger. At the time the photograph was taken, it was still in an uncompleted state, and no carburettor had been fitted, but since that date, one has been added, and the engine was displayed at THE MODEL ENGINEER Exhibition. Further details will be given at a later date.

Overheard at the Exhibition

● AS EVER, the most popular and frequently recurring question at the exhibition is "What is that for?" and a close second is "How does it work?" These questions were fired at the stewards and stand attendants at the exhibition with machine-gun rapidity, and were unfailingly answered with promptness and precision, not to mention infinite patience, but when some of the visitors took upon themselves the duty of acting as mentors to family parties, one occasionally heard some illuminating and diverting answers. To give but one or two examples which are perfectly authentic, we may quote the lady who told her small boy that the Churchill tank was operated by "mental telepathy," or the three enthusiasts who indulged in a heated argument as to whether the engine on the "M.E." Workshop stand was working on (a) hot air, (b) steam, or (c) a concealed electric motor under the bench. When informed that it was working as an internal combustion engine, they unanimously agreed that it was "quite a good joke." However, they went away finally convinced that their legs had not been pulled.

On the demonstration stand a schoolboy was very anxious to try his hand at boring a piece of wood in the lathe, and on being asked by the demonstrator whether he had ever done any boring before, he replied: "Yes, certainly, I've bored lots of 'conkers'."

In the course of a discussion on the design of small high efficiency model engines, a critic remarked: "The trouble with you model engineers is that you always try to get a quart into a pint pot." The model engineer replied: "Yes, but any fool can put a pint into a pint pot."

We would not like to vouch for the strict truth of the following story, and have quite a shrewd suspicion that it may be one of the many variants of the tale of the "left-handed teacup" or the "nail with the head on the wrong end," but here it is, for what it is worth. During the fitting up of the stands, one of the workers went to a neighbouring stand to borrow a screwdriver, and was handed one of the ratchet type, which he took away and returned a minute or two later, saying: "This is the wrong one; it's only for unscrewing the screws" The owner of the screwdriver fumbled under the stand counter for a minute, and shifted the catch of the screwdriver, handing it back to his friend, who took it away quite satisfied that he now had the right tool for the job.

The Miniature Grand Prix

● THOUSANDS OF visitors to THE MODEL ENGINEER Exhibition have unanimously approved the new form of model car racing which we presented this year for the first time.

Equally enthusiastic in their approval were Britain's Ace Grand Prix racing drivers, Reg Parnell, Stirling Moss and Bob Gerard, who kindly accepted our invitation to come along and "drive" in the smallest ever Grand Prix event. The meeting was a great success, Reg Parnell winning by over a minute on one of the two scale model B.R.M.s. The presentation of the handsome miniature silver cup was ably effected by Bob Gerard's charming wife, Joan, who also presented to Stirling Moss a cash prize of one half-penny (we mean that!) to commemorate an equally successful second place. Bob Gerard, on this occasion, had very bad luck, his yellow Largo Talbot breaking a connecting-rod on the starting line.

To satisfy the heavy demand for information, an article is being prepared and will appear in the near future. In the meantime readers who intend building cars and/or tracks would do well to write to Henri Baigent Ltd., Hut 200, Hurn Airport, Christchurch, Hants, who will be pleased to furnish all particulars regarding cars, materials and construction.

Incidentally, Mr. Baigent must get full marks for bringing real model car racing into existence. Now that he has conquered the difficulty of steering *real* scale model cars around *real* scale model circuits, there can be no doubt at all that this branch of model engineering will enjoy the revival it so richly deserves.

Musical Boxes

● ONE OF the most enjoyable highlights of exhibition time is the renewal of old acquaintances and friendships. Invariably conversation switches to the activities of the interior period, and notes are compared and views exchanged on almost every conceivable aspect of our hobby.

Talking to one very dear friend the other day, we were intrigued to hear that he had embarked upon the collection of old musical boxes. Amongst his recent acquisitions was a superb example, with bells, drums and other delightful effects, but, unfortunately, most of the pins on the cylinder were either bent or broken—and there are somewhere in the region of twelve thousand of them! Yet, this friend of ours is firmly resolved to restore the instrument to full working order and we have no doubt that he will succeed. However, there may be many more readers similarly interested, and we are sure that a "get together" on musical boxes in general would be of immense general interest. Correspondence on this subject should be addressed to "Music Box," at these offices.

The Lighter Side

● LIKE ALL good "M.E." Exhibitions, this year's has had its fair share of humour intermingling with its own serious side. For instance, on the day before the opening, a charming old gentleman put in an appearance at the reception table in the foyer where models were being received by a member of THE MODEL ENGINEER staff. "Good morning," said the old gentleman, "can you tell me whether there is a book stall at the exhibition?" "Well," said the staff member, "the exhibition does not open until tomorrow, but Messrs. Percival Marshall will most decidedly have a stand and carry their usual large range of books. But perhaps you would like to indicate the particular book in which you are interested, then I could no doubt inform you beforehand whether it will be obtainable." "Delighted," said the old gentleman, fidgeting in his breast pocket, from which he produced a list of doubtful age. Running a bony finger down the titles, he eventually denoted his choice.

Our representative, adjusting his spectacles, and, as if to reassure himself, glanced enquiringly around him at the many fine examples of craftsmanship adorning his table. At length, he smiled understandingly and addressed the old gentleman. "I am sorry, sir," he said, *Flowering Shrubs* are not exactly our line; you see, this is THE MODEL ENGINEER Exhibition."

The Manchester Society's Track

● AUGUST BANK HOLIDAY was a red-letter day for the Manchester S.M.E.E., because the 660-ft. multi-gauge locomotive track was opened on that day by Mr. McMillan, director of Parks, Manchester. This addition to the growing number of such enterprises is situated at Platt Fields and is laid for 2½-in., 3½-in. and 5-in. gauges.

The first public run was made by the chairman, Mr. Peake, driving his 3½-in. gauge L.M.S. Mogul, hauling Mr. McMillan. After that, the children of Manchester were given free rides and, needless to say, not once were any "empty coaches" seen! Two other locomotives gave excellent service that day; they were a 3½-in. gauge *Bantam Cock* by Mr. Bodder, of the Stockport Society, and a 5-in. gauge side-tank engine by Mr. Mercer, of the Warrington Society.

We are interested and glad to note that this venture has been successfully launched and we congratulate all concerned; may they henceforth enjoy trouble-free running and much prosperity.

Those Model Galloping Horses

● WE PUBLISHED a reference in our August 2nd issue to a fine model built by "Mr. Slack and some friends" at Chapel-en-le-Frith. We have now been informed that the model is the work of Mr. Slack *alone*, and that the previous information was given out under a misapprehension. The model, therefore, must be even more creditable than we were at first led to believe, and we are more than ever keen to see an illustrated description of it.

A Change of Secretaries

● WE HAVE been advised that Mr. John Barker, hon. secretary of the Aircraft Section of the Grantham Society of Model Engineers, has left the district and has, therefore, resigned from the post he has held for so long. His successor is Mr. C. J. Pearce, 55, Uplands Drive, Grantham, to whom all communications regarding the model aircraft activities of the society should be addressed in future.

My Impressions of the "M.E." Exhibition

by W. J. Hughes

ON the day before the opening of the 1951 "show," it was scarcely credible that the opening could possibly take place on schedule. Doubtless, club members will recall similar scenes at their own local exhibitions! However, the furious activity which was taking place did not deter your scribe in any way from examining the models which were slowly trickling in from the packing-cases heaped in the foyer, and which in the evening came in in a steady stream, borne in the proud and affectionate arms of their owners. But it must be admitted that the said scribe was the recipient of some uncommonly dirty looks when he got in the way of busy workmen or stewards!

An impressive and well-built model is the 80-in. (bore) Cornish Pumping Engine by R. F. W. Jarvis, illustrated and described recently in the "M.E." Built to 1-in. scale, the model is over four feet tall, and is excellently finished. The lovely intricate detail of the valve-gear is worth close study, though to be properly understood it is desirable to have a previous knowledge of its working. Such a model is of great value not only to the present generation, but to posterity—so many of the prototypes have now disappeared, alas!

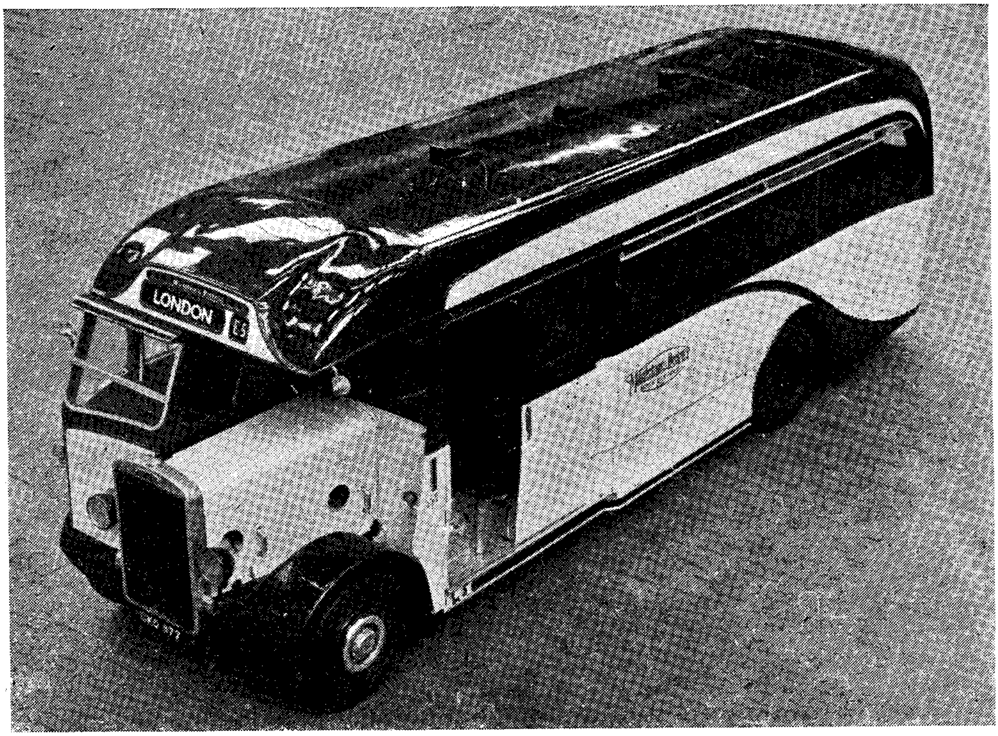


Fig. 1. This 1½-in. scale motor-coach by S. J. Funnell was very well detailed, and with an excellent finish

I was fortunate enough to have a chat with S. J. Funnell, whose Leyland "Tiger" motor-coach, to 1½-in. scale, can be controlled remotely by cable (Fig. 1). It is driven by an electric motor converted from a dynamo, which is well disguised as an internal combustion engine. Top speed is about 5 m.p.h., which as the builder says is quite fast enough when one is at the other end of the cable! The body was built from

blueprints of the prototype, but the full-size chassis was measured up. Tinplate and aluminium on a beech framework were used for the body panelling, the latter where intricate shapes were required, such as at the front and rear of the roof, which was beaten to shape. All detail fittings were there, and the cream and green paintwork was nicely finished. Would that the same could be said for every model in the hall, but as usual, this was a feature spoiling many otherwise high-class models.

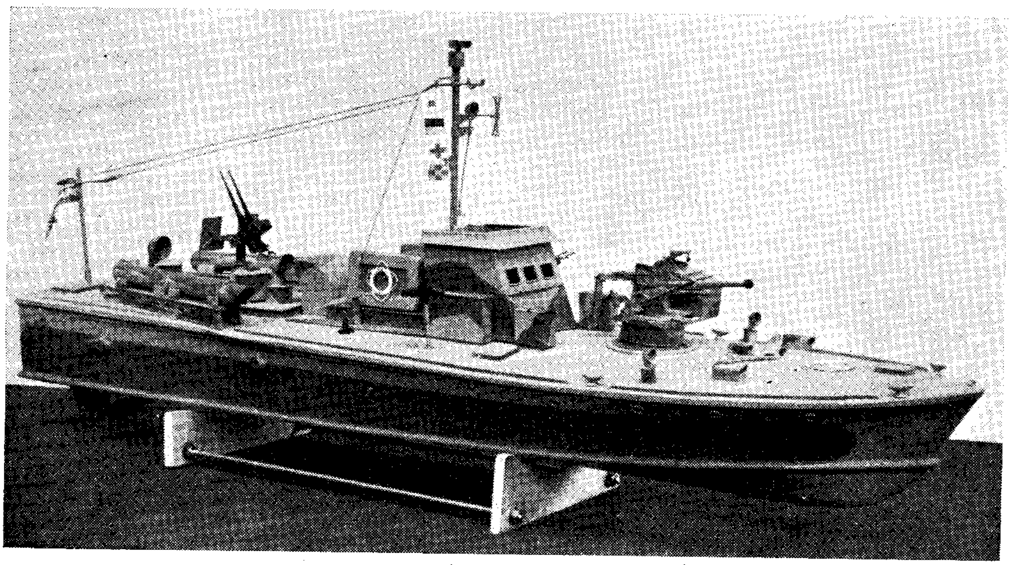


Fig. 2. A very fine ½-in. scale Vosper M.T.B. by E. A. R. Mace, with twin-cylinder water-cooled engine and radio-control

Model Motor Torpedo Boats

Another pleasurable conversation was with E. A. R. Mace concerning his ½-in. scale Vosper M.T.B. He told me that the hull was built to my own drawings, published by Percival Marshall, but that he had decided to fit the later type of armament which includes a six-pounder gun. In addition, instead of using a plywood skin, he has used the double diagonal mahogany planking of the prototype. Details of the armament were difficult to obtain, but finally valuable assistance was forthcoming from the Imperial War Museum, and it must be agreed that Mr. Mace has made a grand job of them.

Internal arrangement of the boat is just as neat, with a handsome twin cylinder watercooled side-valve petrol engine of 6.45 c.c. capacity fitted amidships, and the aft compartment filled with an intricate maze of apparatus for radio control. All in all, a very fine model indeed.

Another excellent Vosper M.T.B. model to the same drawings, but with the original armament, was that of C. J. Brooks, and it was very interesting to compare his boat with that of Mr. Mace. The builder can pride himself on a realistic-looking job, and I hope we shall see more of his work in the future.

Model Tilt-Hammers

The scale model stand of tilt-hammers from Pipworth Road Secondary School, Sheffield, created much interest, and in fact this type of machine was entirely new to many of the visitors, as was freely acknowledged. The model (Fig. 4) was built by senior boys, with assistance from their handicrafts masters, and had been scaled down from a set installed about 1820 in a Sheffield forge. The waterwheel shaft carries an oak-cogged spur-wheel, which drives the cam-shaft on which a 16 ft. diameter flywheel stores the energy. The cams press down on the tails of three of the hammers, but the other hammer at the rear is lifted by its nose. Incidentally, a stand of similar but smaller water-driven hammers is still at work in Sheffield, being used in scythe forging.

That American Old-Timer

Still another fortunate encounter I had was with V. Hotchkiss, who had just brought in his old-time American type 4-4-0 locomotive (Fig. 5). Built to ½-in. scale, this engine does not represent any particular prototype, but is based on general American design of the 1875 period. The engine is coal-fired, and Mr. Hotchkiss says she runs well, though he has not tried her on passenger hauling yet. Actually, it is rather his ambition to build a complete scenic garden layout, with coaches, buildings, and other accessories to match the engine.

All the work was done on an Adept 1⅝-in. centre lathe—quite an achievement!—and all

the parts with the exception of a few 10B.A. screws and the pressure-gauge were made by the builder, including the patterns.

A model Ford "Jeep," by R. J. Wallace, had been made while on active service—"mostly in the open air," to quote the builder—from all kinds of scrap material. It was an extremely realistic model, with very good detail work, down to such things as sparking-plugs and working windscreen wipers. No, the plugs *didn't* spark—but I would wager that 99 per cent. of the beholders thought at first that the tyres were real rubber, pending closer examination. The accompanying photograph will show the fittings better than a long description, however.

Models of Road Vehicles

Two examples of model coach building were the London to Holyhead coach by R. J. Thomson and the Tandem cart by P. Winton. The former was to a scale of 2/3 in. to 1 foot, and was complete with the driver, four horses, and the guard. It made a very picturesque model, but the detail and finish was not up to the standard of Mr. Winton's smart equipage, shown in Fig. 7. One could imagine a young blood of the early nineteenth century perched on his high seat, and whipping up his lathering horse as he bowled along in a cloud of dust!

A Beautiful Clock

The spring and fusee-driven bracket clock by C. B. Reeve was a most handsome piece of work, with a case finely veneered in burr walnut. From what could be seen of the movement through the side glass panels, this, too, appeared to be equally well made, and the clock must have given many visitors a good deal of pleasure in the beholding. For the horologically minded, the clock has a pin pallet and dead-beat escapement, and strikes the hours. It only needs winding once a year, by the way.

Burr walnut was used also in the making of a lovely little boudoir grand piano, made to 1-in. scale by J. H. Starck. It is in Queen Anne style, and fitted with an automatic musical movement, so that when the keyboard cover is raised, the piano plays the "Blue Danube" waltz. I for one should be very pleased if Mr. Starck would give us the details of the mechanism of this fascinating model.

Another exhibit which greatly appealed to me, though not in the model class, was the pair of wood carvings by G. Gibbons. Two small panels of lime bore in low relief a male and female ballet dancer respectively, and to one who had recently endured some of the alleged works of art (?) in the South Bank Exhibition—I except one or two of them—these came as a blessed palliative! (In passing, wouldn't a passenger-hauling locomotive or model power-boat look queer, built in the same style as a modern "masterpiece" of sculpture?)

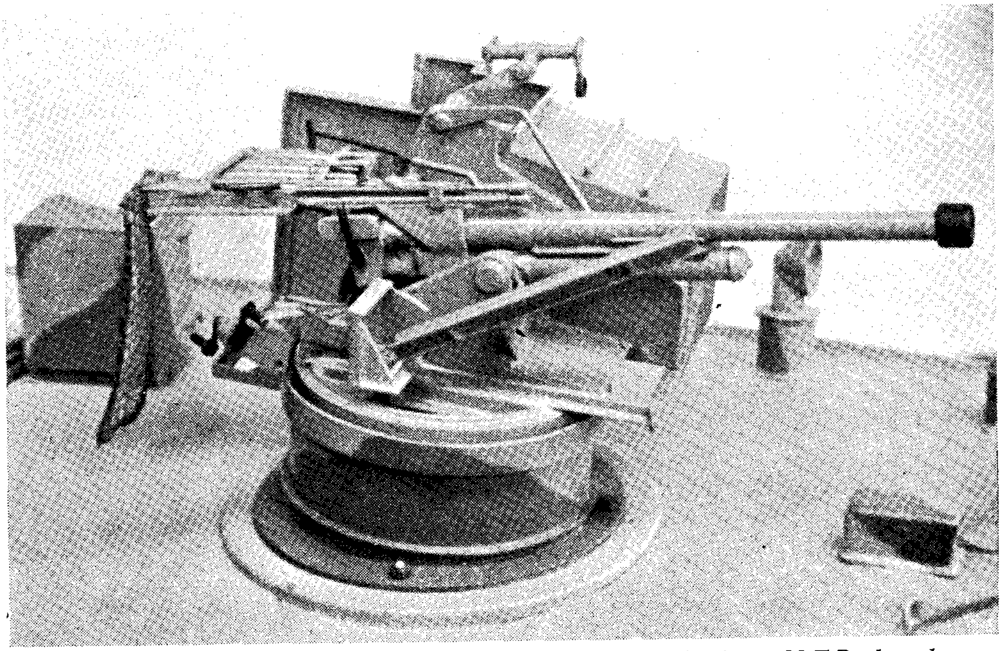


Fig. 3. This photograph of the six-pounder gun fitted to Mr. Mace's Vosper M.T.B. shows how excellently the detail work was carried out.

Guns

Several gun models were to be found this year, and as an example I have chosen the Vickers 4.7 naval quick-firer by H. W. Hansen (Fig. 8).

Displayed with several "shells," presumably live, the model had correct type training gear, and was fitted with a screwed breech-block. It provided a very effective contrast to the 8-in. howitzer by Capt. J. D. Adamson, a much more intricate model complete on railway mounting, with spreaders and jacks to counteract the tremendous recoil.

Marine Models

In the Marine Section, one could spend days in studying detail, and my chief regret was that my schedule did not permit these. In any case, this section will be dealt with by others, but I must mention the very neat, tidy, and thus attractive engine room of the steam tug *Conservator* by R. L. Allen. Some boats are a delight to the eye outwardly, but when one lifts the decks the illusion is dispelled. Not so with this tug—it was obvious that much thought had been expended on the layout of the whole steam-plant which, incidentally, included air-pump and condenser. A very nice job indeed.

I deliberately looked for a further marine model, knowing that the name of D. McNarry guaranteed something worth looking at. Nor was I disappointed, for the workmanship put into his 12-gun brig-of-war was, to quote a bystander, "fantastic." As an example, the guns themselves were about 3/32 in. long overall, and the hull bottom was sheathed in several hundred *separate* copper plates about 1/50th in. wide and 4/50th in. long. Phew!

Things to Come

Talking of miniatures, A. A. Sherwood's amazing steam-driven locomotive to 2-mm. scale is another piece of beautiful craftsmanship, but this, too, will doubtless be described more fully elsewhere. As for R. V. Gardner, who put a model of the *Cutty Sark* in an ordinary 2.5 volt torch bulb, *Victory* in another, and a galleon in a third, what will he do next? Put the *Pommern* in a pea-sized bulb? I shouldn't be surprised at anything now.

Grand Prix Racing

I had by now gravitated to the foot of the dais steps, where these small models were displayed in a glass showcase, when a familiar sound came from the platform above, and there in progress was a rehearsal of the Grand Prix racing in readiness for the morrow when the show would be open to the public. Undoubtedly, this is a very fascinating sport to watch (and to take part in, one would imagine). To see the sleek red and green cars hurling themselves round the track, now neck and neck, now one nose poked ahead, zooming down-hill into a fast curve, or up-hill into a hairpin bend, is a thrilling sight indeed. It did not require much imagination to forget the unobtrusive guide-rails and to visualise the cars under human control. It should be emphasised, by the way, that this system has only a single rail for each car, unlike the more familiar method where one gets the

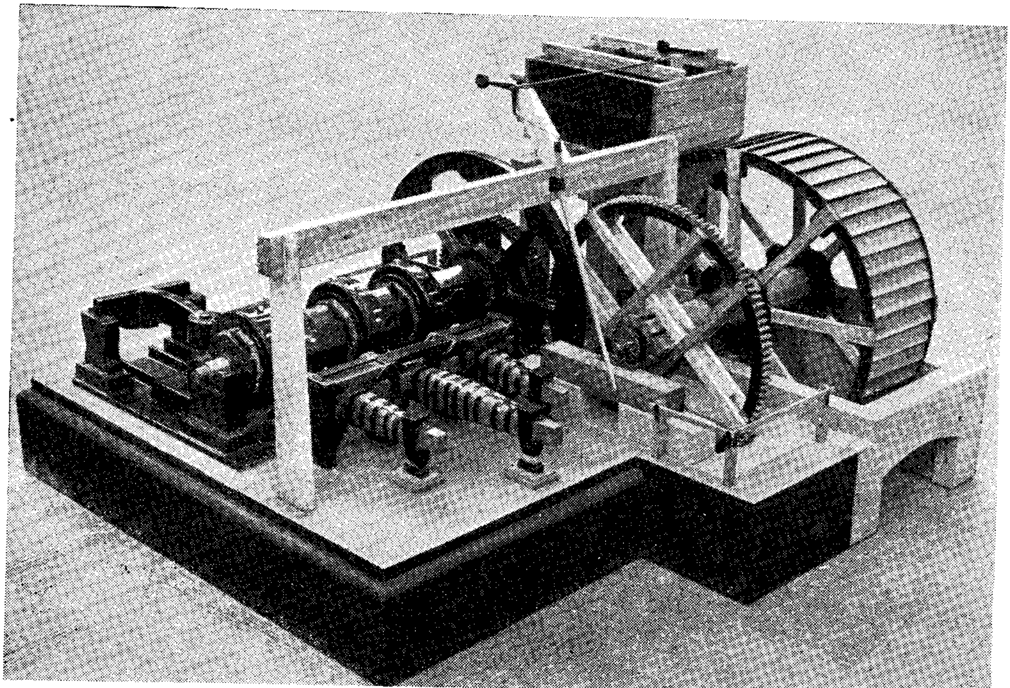


Fig. 4. A stand of water-powered tilt-hammers built to ¾-in. scale at Pipworth Road Secondary Modern School, Sheffield. Note the extensive use of wedges to true up the rotating components and in the general assembly.

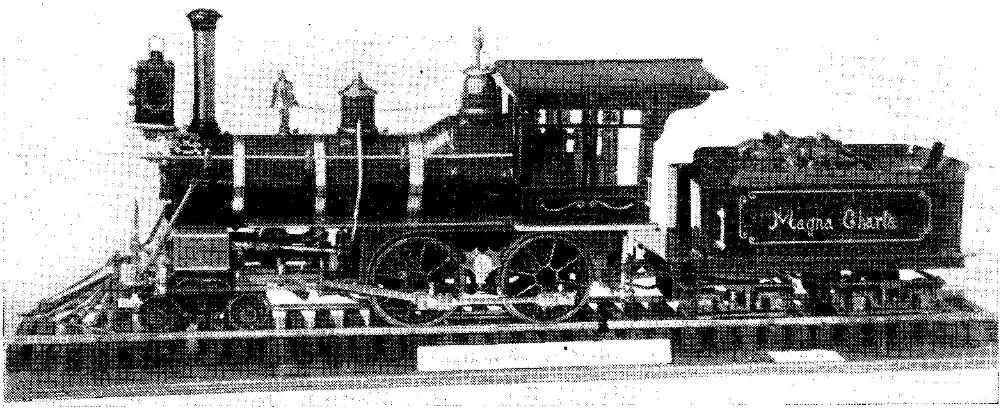


Fig. 5. This ½-in. scale American type locomotive by V. Hotchkiss was a picturesque model. It is fitted with slip eccentric reversing-gear

impression that the cars are fenced off from one another. Another factor which adds to the realism is that footbridges, railings, paddock, pits and other scenic effects are present.

The Official Opening

It was at that stage, late in the evening, that my feet, which had been protesting for some time, finally had their way and led me to the station en route to my temporary abode, to start to write up these notes.

Then up in the morning early—well, reasonably early!—and back to the Exhibition Hall for more notes and more photographs, and for the official opening.

Fig. 6. A 1-in. scale model of a Ford "Jeep," built on active service in the Far East, using chiefly scrap materials.

The latter took place with a minimum amount of ceremony, but was impressive none the less. A Churchill tank four feet long stood on the dais, and the following message from Mr. Winston Churchill was read :

" I should have liked to be with you this morning to see the Churchill tank model open your Exhibition.

" Model engineers play a part in our industry in war and peace and help to preserve our heritage of craftsmanship.

" I wish your exhibition every success,

Winston S. Churchill."

The tank then moved forward under radio control and burst through a greatly enlarged copy of " The Model Engineer." A momentary pause, the turret revolved, and the gun fired. There was a burst of clapping, and the brief ceremony was over.

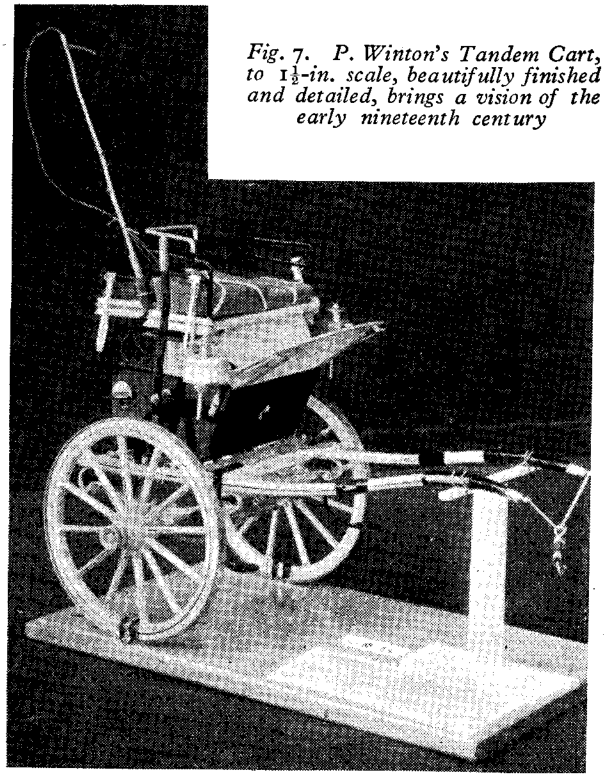


Fig. 7. P. Winton's Tandem Cart, to $1\frac{1}{2}$-in. scale, beautifully finished and detailed, brings a vision of the early nineteenth century

Built by A. J. Tamplin in 2,500 working hours, this tank is very complete, and was later demonstrated in action many times. It weighs $2\frac{1}{4}$ cwt., and can obey up to 16 different instructions by radio.

Other Demonstrations

A large water-tank had been fitted up, and many marine demonstrations took place on it. The tank itself was raised well off the floor, so that the surface of the water was not much below eye-level, and the illusion of reality was greatly heightened thereby. Dr. Rex Stansfeld demonstrated his lovely model of the S.S. *Port Brisbane*, one of the latest cargo-vessels, which was controlled by under-water sound transmission, and also the sinking of the *Egypt*. This model listed, caught fire, and listed still further. With flames and smoke pouring from her, she went lower in the water, then suddenly righted herself, and went down by the head.

The Radio Controlled Model Society showed many boats at work, and there was an opportunity for members of the public to try their hands at this sport. The M.P.B.A. also showed some very fine prototype models—steam, petrol, and electrically-propelled—at work, and demonstrations of steering competitions were staged.

An unusual model on the tank was a jet-propelled flying-boat, which took off, flew round the pole, and landed. There was also a jet-driven helicopter equipped with pontoons, which proved too enthusiastic! It took off, soared higher and higher, and wrecked itself against one of the hanging lamps. Hard lines!

Other models shown working included several steam engines and pumps on the S.M.E.E. stand, and the scale model traction-engine by the Sutton M.E. Club.

Other Models at Random

The above sub-heading is not intended to suggest that the models now to be mentioned are inferior in any way to those previously described —it just happens that this part of this article was written after an intervening period.

For example, D. McNarry's other exhibit—a Dockyard Model of H.M.S. *Prince* was to me equally meritorious with his 12-gun Brig. Perhaps the judges will be able to differentiate between them, but I couldn't. The marvellous work on the figurehead alone was joy to the eye.

A. D. Pole's 5-in. gauge locomotive, *Cornwall*, built to $1\frac{1}{16}$ in. scale, came in the latter category, too. Such a model is of value not only as a working model, but also as a reminder to the younger generation of the foundations built by a previous one. It does seem a pity that so few constructors delve into the past for inspiration, for the information may not always be available. On the other hand, I suppose, it could be argued that information about modern prototypes is more or less readily forthcoming at the present time, but will become less so in the future! The chief trouble seems to be that very often the model engineer does not take sufficient pains to seek out the *correct* facts, and the result may be glaring inaccuracies which could have been avoided. Such inaccuracies and faults are all too prevalent, and one of the worst features of this is that a future generation may be deceived thereby.

To revert to the models, I must confess that a certain Marblehead Class Yacht rather appalled

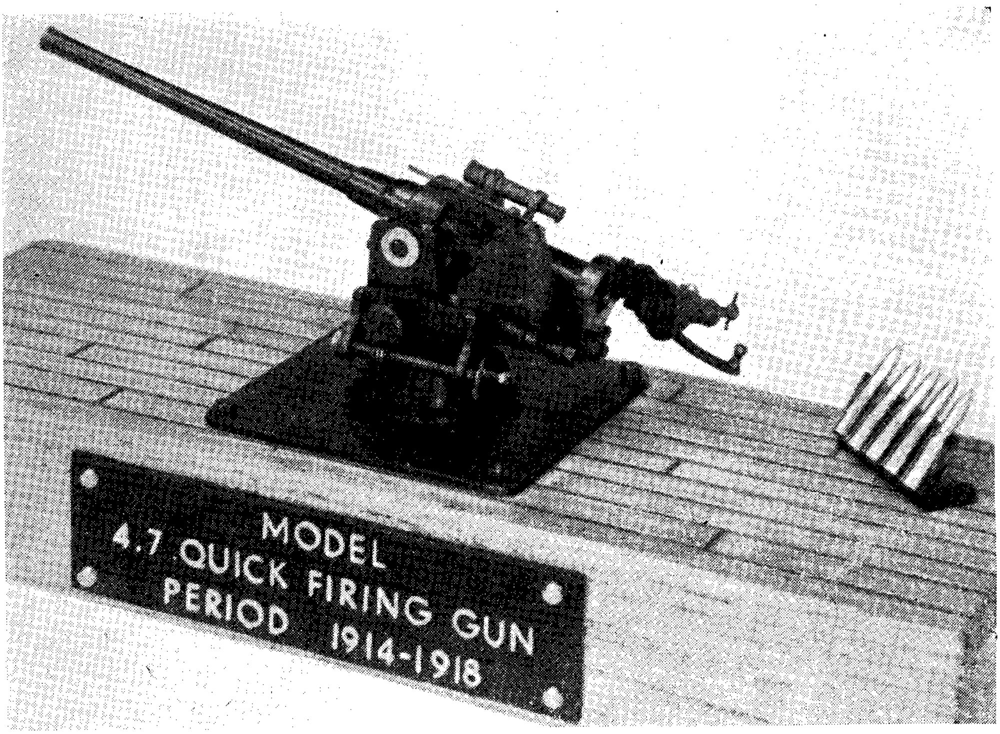


Fig. 8. The 4.7 Vickers quick-firer of the First World war provides an interesting comparison with the six-pounder of the Second War, shown in Fig. 3

me. It was christened *Jemima Duck* and looked it. I am well aware that the reason for the horrible shape of this hull is to allow the utmost advantage to be taken of a set of rules, but I am also old-fashioned enough to believe that a yacht should be the quintessence of grace and beauty. And when a set of rules results in a snub-nosed pot-bellied hull like this, then surely it is time to scrap the rules! Incidentally, the standard of paintwork on this hull was quite one of the best in the whole exhibition.

Painting

Which brings me once more to a mention of paintwork in general. I think that there is *some* improvement on former years, but only too often one obtains the impression that the builder couldn't care less about the finish. It is simply absurd that a man will spend months or years on building a model and then spoil its whole appearance by careless finish. If he were asked to hurry the machining of some part, he would be horrified: yet he will gaily slap on two or three coats of paint in gay abandon, without adequate preparation or care.

Such a man may make the excuse that he is "no good" with a paint-brush, but that is rubbish. Ninety per cent. of model engineers are no good with a lathe or a file when they start the hobby, but they *make* themselves proficient. And any man who can do that can make himself equally proficient at painting the finished job—*as has been proved by others*!

The same applies to lettering, which I do not think has improved this year. There are plenty of books on the subject in the shops or in the public libraries, and one can practise with a brush and indian ink on paper, before graduating to practising with paint on a painted surface. Very often the type of lettering is at fault, too, and this should be studied on the prototype or other suitable source before embarking on the finished object.

Traction Engines

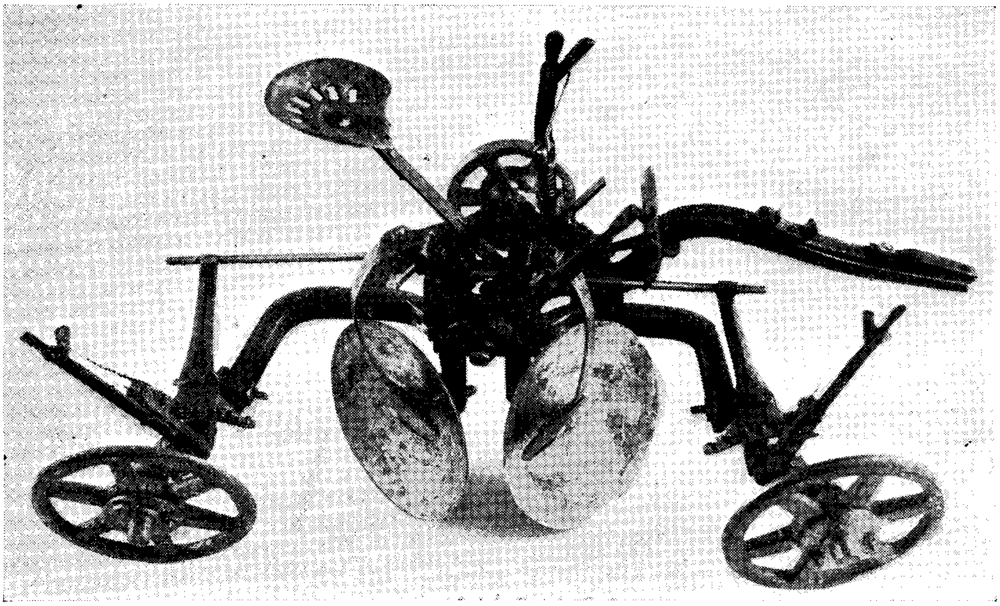
It may have been noticed that I have not mentioned traction engines in this article, but, as last year, I shall be dealing with these in a separate and more detailed article, which will also include the portables.

In conclusion, it is hoped that any criticisms made will be taken in a friendly spirit by the exhibitors concerned, as the sole intention is to be helpful and not to "tear a strip off" them.

"Chattanooga"—A Model Plough

by Fred Collett

EARLY in 1912 I landed in Queensland, Australia, with the idea of at least bettering myself, if not making a fortune. I made my way to the wee township of Gin Gin, on the Bundaberg-Mount Perry railway line. In this district I spent several years, working on the land for



Mr. F. Collett's model plough, reproduced approximately full size

various "cockies" or farmers, until late in 1913 I found myself on a farm named by its fond owners, "Utopia." The reason for this flight of fancy I never discovered, but we were a reasonably happy gang; three partners, who owned the land, and two or three hands, such as myself, ploughing and generally working the land, and cutting and loading the sugar cane at harvest time. A proper nigger's job.

The horses we used were very light in weight for such heavy toil, and being tender-hearted, I gave my team of three a "blow" whenever I thought fit, and chanced what the bosses might say.

Sometimes, during these rest periods, I would clean and grease the implement, generally a Chattanooga twin reversible disc plough, while the horses recovered from the last bout or round. Sometimes I'd try to catch lizards with a loop of horse hair taken from Nugget's tail. Or I might tour round for a few yards hunting small snakes, or see if there were any Passion fruits ripe on the nearest vine.

Then one day, I thought how uncommon a scale model of the plough would be. I had brought tools out from England, in case land work proved too tough for me, and there was a very small plain lathe amongst those tools. So, instead of snake-catching, see me with a rule and paper and pencil making dimensioned sketches of parts of the plough. Then, when the poor horses' shoulder muscles had stopped quivering, round we went again for so many bouts, and then another bit of a sketch.

Before I could start making parts of the model plough, I had to rig some kind of wheel, with a treadle, to drive the lathe. In those days, bolts and nuts and similar ironmongery were exported in almost cube-shaped galvanised iron tanks, with lids like small man-hole covers. I found such a lid on the rubbish heap, and I rigged it, with a treadle, under the bench in the barn. I had in my kit a "douzieme" gauge, which measured approx. 1/144 in. per division on the scale, and this decided me in making the model 1/24 full size.

I spent many happy months in working on the parts on wet days (rather rare) and during off-times at weekends.

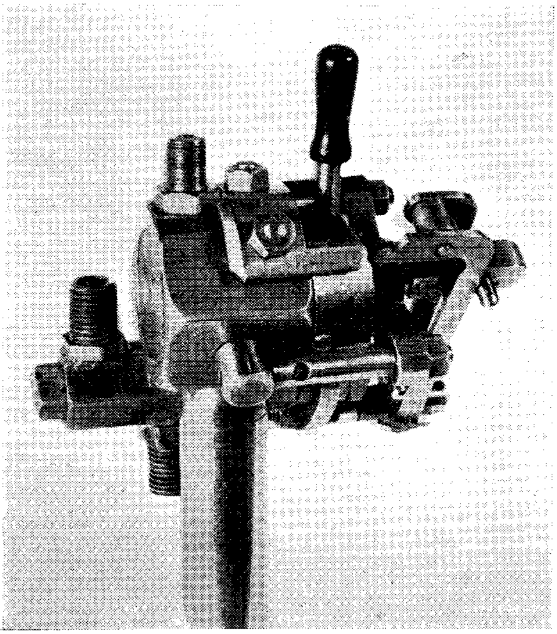
The whole model plough is really built from scrap—a clock spring, two wire nails, a large washer, bits of galvanised iron, and broken

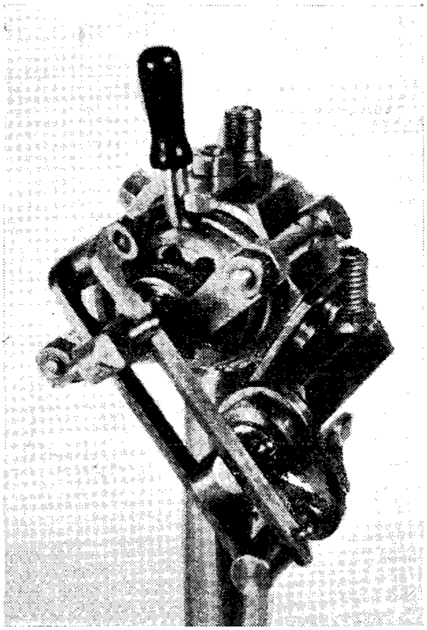
(*Continued on page* 350)

A Vacuum Brake Application Valve and Steam Brake Combination

by John W. Smith

KNOWLEDGEABLE readers who can go back to the pre-grouping days, and they are many, will recollect that the railways were divided in their choice of brakes. On the North British, Caledonian, G.N. of Scotland, North Eastern, Great Eastern and London Brighton & South Coast, the Westinghouse was used. The





remainder used the vacuum apparatus, including the " Big Three," namely, the Midland, London & North Western and Great Western. Here again was division, though relative; for, whereas these three large railways preferred their own form of vacuum brake, and made the necessary parts themselves, the remaining companies adopted the proprietary apparatus of the concerns manufacturing this class of speciality. The large companies, no doubt, saved money on royalties for patented articles, by their undertaking the construction of their own design of brake gear.

With these facts in mind, as a background, the following matters appear the more clearly. Therefore, when it was decided to fit a fully automatic vacuum brake to twin platform cars, in conjunction with a steam brake upon a 5-in. gauge 0-4-2 locomotive and tender, various schemes were considered to advance that end. There was the late H. Greenly's simple vacuum brake—*Models, Railways and Locomotives*, Vol. 5, May, 1912—and again in *Engineering*, December, 1915. The matter has also been dealt with by a well-known MODEL ENGINEER contributor in the course of popular weekly articles on model locomotives in general. None of these devices, however, appeared to be the wanted thing, so it was thought best to adopt a type as used by a railway company, and this led to preference for a Midland Railway application valve and steam brake combination. It is to be noted, in passing, that, in modified form, the late L.M.S. adopted this valve; it also has a close counterpart on the Great Western.

A very clear drawing is given in the *Locomotive*, Vol. 15, December, 1908, of a Midland Railway vacuum application valve and steam brake combination, together with the parallel Great Western arrangement at that time. A complete Midland type brake gear appears in *The Vacuum Brake*, by Brinkworth.

To set about the task of developing a gear, modified for model work, offered interesting work, and was first undertaken in 1945. The question of scale was settled by not aiming at any close proportional relationship, but by making the

disc body as large as was thought practical to get into same the balance piston, and to provide space for the air ports. Somewhere about the size of sixpence would look right; but it was found that a little larger did not offend, and very greatly assisted in developing the layout, as well as providing working space for the steam valve body and its attachments. In the set-out of the boiler backplate there was no provision for attaching the finished unit thereto, so a stand was arranged, making it a self-contained entity. Some smiles were raised about this, one or two referring to the gear as "that ship's telegraph." Alas, so dangerous a thing is a little knowledge! They had never heard of Henry Alfred Ivatt, or his two-pipe automatic brake system on the Great Southern & Western Railway (Ireland), whereon it was fitted in 1891. The system, with illustration, is very fully described in "The Modern Locomotives of the Great Southern & Western Railway," by Ernest E. Joynt; *The Locomotive*, Vol. XXIII, June, 1917. Modern American cabs often contain duel pedestals, combining the straight and rapid-acting brake; we are in good company.

Coming to sizes on the model, the control piston is $\frac{7}{16}$ in. in diameter, and its rod $\frac{3}{16}$ in., all in one piece. The steam valve is a bronze ball, 5/32 in. diameter. The ratio of the tool steel linkage 3/1, and the pivot pins from needle roller-bearings, beautifully hard, and exactly the thing for the job.

The angular displacement of the levers can be adjusted over a wide range, as in full-scale practice, to get the optimum functioning position. In this connection, a cam is provided, just like the larger prototype, so that should the steam valve fail to open, on admission of air to the train pipe, via the air ports in the disc, a positive opening is assured. Nominally, of course, the steam pressure behind the steam valve overcomes the lack of equilibrium on the air piston, when the brake is applied. The control face has four ports triangular in form, and arranged to provide a differential opening as the disc is travelled across the quadrant.

A gauge connection direct into the chamber containing the control piston, shows the vacuum inches registering, by means of a gauge 1 in. in diameter. This was made by a well-known model maker now living in retirement at Bridlington. It is a fine job of work, involving, as it does, a double leverage system, the Bourdon tube working under contraction, as is well known. The application stand is connected by piping under the footplate, to the ejector, and the train pipe connections. The usual quick attachment vacuum pipe ends are not provided, all conditions are fully met with ordinary nut couplings, with leather washers between.

To date, no trial has been possible, as many things still remain to complete, but confidence in the application stand itself can be taken for granted. This is not the place to mention the vacuum cylinders, or the ejector with its double air-lock valves, or to refer to the special steam brake cylinder, based on Twining's work, or the use of a Webb floating lever between the engine and tender brake rodding.

The photographs show views of the brake control unit. They were taken by K. N. Harris, who showed great interest in this piece of work, when in Glasgow. He later had it down at Harrow, and thanks are due to him for the excellent prints and for permission to publish. They show, as no line drawing could, the important features of this vacuum brake application valve and steam brake combination.

"Chattanooga"

(*Continued from page* 348)

banjo wires, such stuff as can be found on nearly any bachelor-run farm. The "Chattanooga" is what is known as a "one-way" plough. Three horses are harnessed to the beam. The operator sits on the seat provided. The lever immediately in front of him, as he sits, moves the two side wheels, enabling some steering to be done. The lever on his right controls the cutting discs, raising one and lowering the other in one movement. The levers at the ends of the plough, close to the wheels, control the depth of the cut which the operating disc can make.

When a complete furrow has been made, the operator stops the horses, and releases a trip with his foot, which frees the beam. He then turns the horses round, still seated, and as the horses turn, the beam is carried round together with the operator, and the steering lever until he is facing the opposite way. Then he uses the side lever, lifting the disc which has just made the furrow, and putting the other one down ready to cut the next.

My model is complete in every respect and goes through all the motions; it even has an adjustable spanner to scale.

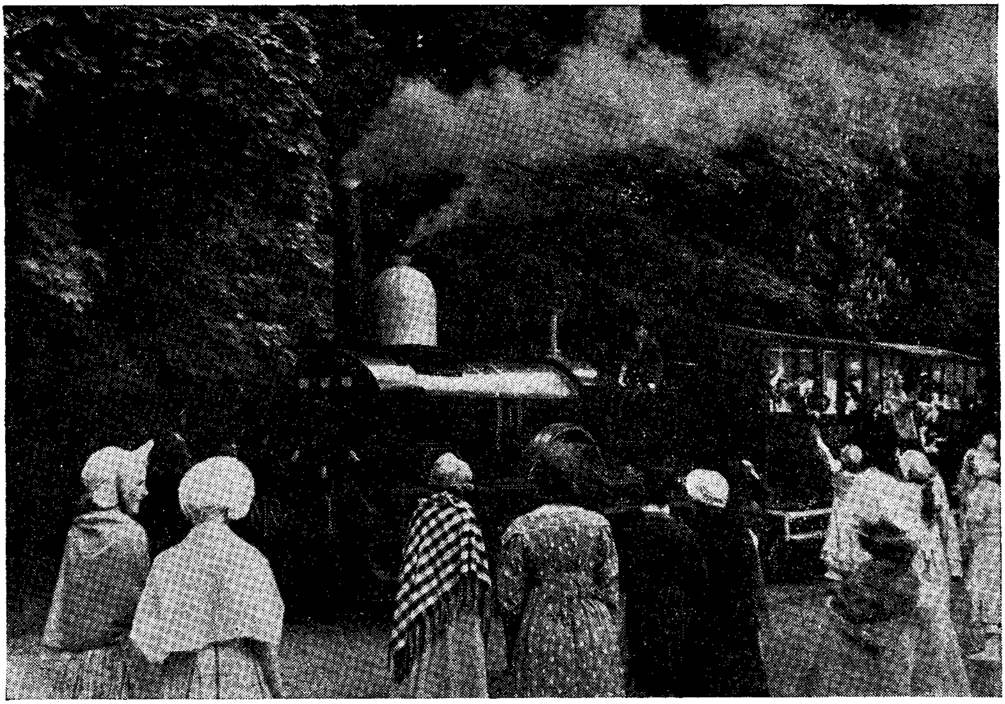
That barn sticks in my memory. It had an earthen floor, on which, and under the bench, hens and chickens disported themselves, while, as dusk approached, just occasionally, Joe, a 4 ft. long carpet snake, would take a quiet slither round to see if there was a mouse or small rat to be had. Quite a pal was Joe.

Such work was, I believe, very uncommon in the bush, and Queenslanders seemed to think there was something fishy about a chap who, while able to turn out tiny bits and pieces, preferred to earn his daily bread as a ploughman. Maybe they were right.

I am indebted to Mr. G. W. Cook, of Holly Hall, Dudley, for the photograph.

HITCHIN M.E. CLUB ENJOYS ITSELF!

by A. G. H. Jenkins



DURING the early months of 1950, the Hitchin Urban District Council decided that it was time to fall in line with the idea of the "Festival of Britain" theme. Being very sensible, they approached the Hitchin Civic and Arts Association for assistance; from that body, consisting of approximately forty clubs and societies of a local character, various ideas were suggested, sifted and what remained were welded into what might be termed a "Festival Month."

The main feature was to be a "Pageant" to depict the history of Hitchin from A.D. 1000-1951, and after the council had approved the scheme, the Civic and Arts Association were commissioned to organise the whole Festival Month. A meeting of the Civic and Arts Association was arranged under their able chairman, Councillor J. Barker, and with the lead of that "busy bee," secretary Mr. A. Kevan, the association got down to work.

The Hitchin Model Engineering Club was requested to build a replica of the first train to enter Hitchin. This had been suggested by a club member, submitted by the chairman, and accepted by the association.

The Squire of the Priory, Mr. Delme Radcliffe, kindly placed a building at the club's disposal for a workshop.

The association and the club secretaries then went to town, looking for authentic records. These were obtained from the Curator of York Railway Museum and the Public Relations Officer of British Railways Eastern Region; drawings were prepared, and a start made. Power and lighting were installed, and working parties arranged, for evenings and weekends. By this time only about nine weeks remained to the opening date.

The locomotive was started, the main frame consisting of 6 in. × 2 in. timber, 22 ft. long, framed with 4 in. × 2 in. cross-members.

The smokebox, firebox, boiler and bunker were constructed of 2 in. × 1 in. batten covered with $\frac{3}{16}$-in. hardboard, and built to dismantle easily; this was necessary to get the locomotive out of the workshop. A pair of tyred artillery wheels were loaned from a personal friend of the club secretary, and these formed the trailing wheels under the bunker. The leading and driving wheels were formed by a Fordson tractor

(*Continued on page* 355)

"L.B.S.C.'s" Beginners' Corner

"E. & O. E."

BEING just a human being with all the faults and failings of the species, plus a few of my own special kind as makeweight, it would be a miracle if I didn't occasionally make a mistake, or leave something out. The good folk who are prone to seize on the slightest slip or omission should try running three locomotive-construction serials at once, doing the necessary drawings *and experimenting*—very important, that last!—and dealing with correspondence queries on all sorts of subjects, to the tune of some eighty-odd letters per week. If they can survive that, week after week, with never a break, and never make a slip or forget something, they are just too good to remain on this planet! Well, bearing the above in mind, I just took a kind of backward glance through the *Tich* serial, to see if it was "all there," in a manner of speaking; and find that there are several things on which a few more extra words would not come amiss, so I'll deal with them before writing off the little contractors' pug as finished.

In the issue of December 14th last, I gave illustrations of the smokeboxes for the larger and smaller boilers, and described how to make them, and drill the holes at the correct location for the blastpipes and chimneys. Well, whether it was because of writing the ghost story, or the reminiscence in the Christmas week issue, or some other distraction, I cannot now recall; but I cannot find any trace of a description of the chimney machining, or any mention of the liner for the chimney on the larger boiler. Apparently, some of the beginner friends had, by the time the smokebox notes appeared, become quite expert at the job, and went right ahead and fitted their chimneys by aid of the drawings only; for I have already had several letters from delighted builders whose *Tich* locomotives are at work and doing the job in the usual "L.B.S.C."-guaranteed style. For the slower workers who need more information, here are a few notes on the "missing links."

Chimney for Small Boiler

As Pat would remark, the smaller chimney is the biggest, begob! It is a simple built-up job, and needs no liner. The barrel is a piece of $\frac{11}{16}$ in. brass or copper tube of about 22-gauge, squared off in the lathe at both ends, the finished length being $3\frac{1}{4}$ in. Chuck it in the three-jaw, and do the needful with a round-nose tool set crosswise in the slide-rest. The rim or cap, and the base, may be made from rod, cored stick, or castings. For the cap, a piece of rod or cored stick 1 in. full diameter will be needed, sawn or parted off in the lathe to $\frac{3}{8}$ in. length. Chuck in three-jaw; and if rod is used, centre, drill a pilot hole about $\frac{3}{16}$ in. diameter right through it, then bore it out exactly as described for boring cylinders, until it is a very tight fit on the chimney tube. Cored stick, or a casting, are bored in the same way, but naturally will need no preliminary drilling, as they will have a cored hole through them. Squeeze the bored ring on to one end of the chimney tube; if you have slipped up, and the fit is too easy, silver-solder it. Chuck the tube in the three-jaw, and turn the ring to the shape shown, or any other shape that may tickle your fancy, using a round-nose tool with a fairly good radius. I keep a small selection of round-nose tools of different radii, which come in handy for special jobs.

The base will need a piece of metal as above, but a wee bit over the finished diameter of $1\frac{1}{4}$ in. If it is a casting, it will be shaped, or saddled, as usually termed, to fit the smokebox, and will only need cleaning up. The easiest way to do this, is to lay a piece of medium grade emery-cloth or similar kind of abrasive material, on the smokebox itself, holding same in close contact with the metal; then put the casting on it, and work it back and forth over the emery-cloth until the curved underside is smooth, a matter of a couple of minutes only. Inspector Meticulous will immediately tell you that this is all wrong, because the curve of the underside of the casting will be greater than the curve of the smokebox, by the thickness of the emery-cloth, and therefore you won't get a perfect fit; but in actual practice, the difference is so small as to be negligible, as you'll find when you fit the chimney to the smokebox.

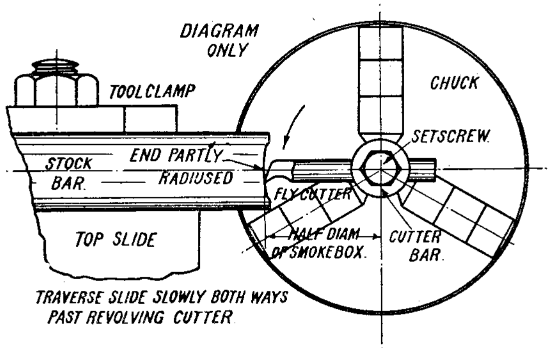
The outside of the casting will also be shaped; and as the irregular curve cannot be turned on an ordinary lathe, use a file and a piece of emery-cloth to smooth it. Drive a piece of wood into the core hole, to serve as a handle, and rest the casting on the vice jaws, partly opened, while first filing off any roughness, and afterwards applying the emery-cloth. If preferred, the casting can be mounted on a piece of round wood, held in three-jaw, saddled side towards the chuck, and the finishing touches put by wrapping a piece of emery-cloth around your finger and holding it against the revolving casting; one of young Curly's antics. It did the trick all right; but the young "indefatigable" was always mighty careful to keep his fingers clear of the chuck jaws! Finally, chuck the casting in the three-jaw, holding by the edges, and bore it out as mentioned above, to a tight fit on the chimney tube. Press it on so that about $\frac{1}{4}$ in. of the tube projects below the saddled part.

How to Machine a Curved Base

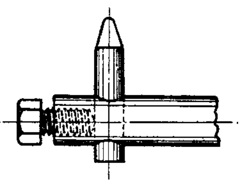
If the base is made from rod or cored stick, it is an easy job to machine the bottom, to fit the curve of the smokebox to a nicety. All you need is a home-made flycutter. This merely consists of a piece of $\frac{1}{2}$-in. round steel rod about 3 in.

long, with a $\frac{3}{16}$-in. or $\frac{1}{4}$-in. cross-hole drilled $\frac{1}{4}$ in. from one end. Drill down the end to meet this cross-hole, using 13/64-in. or 7/32-in. drill, and tap either $\frac{1}{4}$ in. Whitworth or $\frac{1}{4}$ in. $\times$ 40, or O-B.A. if you like ; fit a set-screw—preferably hexagon head—to suit. Make a round-nose tool from $\frac{3}{16}$-in. or $\frac{1}{4}$-in. round silver-steel to fit the cross-hole, and you're all set for the job. Clamp the bit of rod or cored stick under the slide rest tool holder, setting the middle of it level with the lathe centres. Adjust the flycutter so that it projects exactly $1\frac{3}{8}$ in. (half of the smokebox diameter) from the centre of the holder, and put the latter in the three-jaw. Feed up the rod in the slide rest until it just touches the cutter when revolving, then traverse the rod longitudinally by moving either the top slide or the lathe saddle. As the end of the rod passes the revolving cutter, the latter will chaw out a curved groove in it. Feed in about 1/32 in. at the beginning of each traverse, and your patience and perseverence will be eventually rewarded by a perfect concavity at the end of the rod, which will fit the smokebox exactly. Owners of milling machines might do worse than make up one of these flycutters, to fit the taper hole in the mandrel. I have one, the shank being No. 9 B. & S. taper ; the cutter holder is $1\frac{1}{4}$ in. diameter, taking $\frac{3}{8}$-in. square cutters. I find it exceedingly useful for cutting curved surfaces of different radius to those of my regular milling cutters. It was made in an hour, at the cost of a shilling or so ; goot bithneth, eh ? Ye dinna need to spend muckle siller ! The set-up was illustrated in these notes many years ago ; so a " repeat," as the radio folk call it, may be of use to our many new readers who are tyro locomotive builders.

Chuck the piece of rod in the three-jaw with the concave end outwards ; and with a round-nose tool, turn down about $\frac{1}{2}$ in. length to $\frac{3}{4}$ in. full diameter, *starting from the edge of the radiused part*, and taking care not to cut into it. Centre the concave end, drill a pilot hole, enlarge, and bore to a tight fit on the chimney tube, for about $\frac{1}{2}$ in. depth ; then part off at $\frac{3}{8}$ in. from the end of the radius. Mount the base on a piece of wood, to use as a handle ; then carefully file away the sharp edges, until the base is the shape shown in the illustration, the edge of the curved part being a little under 1/32 in. thick all around. If thicker, it will look clumsy. Clean out the file marks with emery-cloth, as mentioned above for the casting, and press the base on to the chimney tube at $\frac{1}{4}$ in. from the bottom. If at all slack, silver-solder it. You should be experts at that sort of job by this time !



(Left). How to machine a curved seating



Simple flycutter

Erection

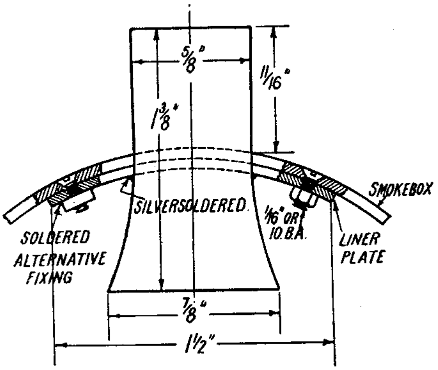
The chimney is easily erected, as it only needs four $\frac{1}{16}$-in. or 10-B.A. brass screws ; or a little thicker can be used if desired. Drill four clearing holes (No. 50 for size of screw mentioned) in the chimney base, equally spaced, and about $\frac{1}{8}$ in. clear of the edge. Insert bottom of chimney into the hole in the top of smokebox ; set it exactly vertical in all aspects—you can do it " by eye " ; they use plumb-lines in full-size practice, sometimes improvising them with big nuts tied to bits of string—then run the No. 50 drill through the holes in the base and make countersinks on the smokebox. Remove chimney, drill out the countersinks with No. 55 drill, tap $\frac{1}{16}$ in. or 10 B.A., smear some plumbers' jointing around the chimney tube where it projects below the base, put the chimney in place, and secure with four screws, roundheads or countersunk, as you please. The whole arrangement is shown in the sectional drawing, in the issue mentioned above.

Chimney for Larger Boiler

This is machined up from a casting, and mounted on a separate liner made from tube. The liner is made from a piece of $\frac{5}{8}$-in. copper or brass tube about 22-gauge. Square off in the lathe at both ends, to a length of $1\frac{3}{8}$ in. Cut a piece of 18- or 20-gauge sheet brass or copper, to $1\frac{1}{2}$ in. square. Drill a pilot hole in the middle, and enlarge to a tight fit on the tube, exactly the same as the holes in the smokebox were made ; then bend the square to the radius of the inside of the smokebox. Push the piece of tube halfway through the hole, taking care to see that it goes through fair and square, so that when the plate is attached to the inside of the smokebox, the liner will stand exactly vertical. Silver-solder the joint, using the least possible amount of silver-solder ; should any ooze through the joint and form a blob on the convex side of the plate, file it off. Now carefully bell out the bottom

end of the liner; this is easily done by driving something taper into it. A piece of hard wood will do quite well, as the soft tube readily expands under pressure.

Drill four No. 50 holes around the chimney hole on top of the smokebox, so that the screws will come on the corners of the liner plate. Countersink the holes with No. 30 drill. Put the liner in place from inside the smokebox; hold it temporarily in place, then put the drill down the holes in the smokebox again, and carry on right through the plate. Remove liner, and put a good smear of plumbers' jointing around the liner, where it comes through the plate; then replace it, and fix with four $\frac{1}{16}$-in. or 10-B.A. countersunk brass screws, nutted inside the smokebox. If the screw-heads don't sit flush in the countersinks, smooth them off with a file, as the chimney base won't bed down on the smokebox if the screw-heads are sticking out at all. Incidentally, weeny nuts are fiddling things to fool around with, inside a little smokebox; an alternative to using them, would be to solder four $\frac{1}{4}$-in. squares of 3/32-in. sheet brass over the drilled holes, on the concave side of the plate. Drill these No. 55, through the holes on the convex side of the plate; tap $\frac{1}{16}$ in. or 10 B.A., and then, when the liner is put in position, the screws can be entered through the holes in the smokebox, into the tapped holes mentioned above, and screwed home.



Chimney liner for larger "Tich" boiler

There will be no need to build up the chimney, as castings are available; I have a couple here now, very clean, and with the curved base exact to radius of smokebox. The casting must be bored to fit over the liner; and about the easiest way to chuck it for the boring operation, is to use a split wooden bush. Chuck a bit of hard wood in three-jaw, and turn about $1\frac{1}{2}$ in. of it to a little over $1\frac{1}{2}$ in. diameter. You can use your ordinary slide-rest tools for this job, as "finish" doesn't matter. Then centre it, and poke an $\frac{11}{16}$-in. drill down for same distance. Part off at about $1\frac{3}{8}$ in. from the end, and saw the piece in two, right across the hole. Put the chim-

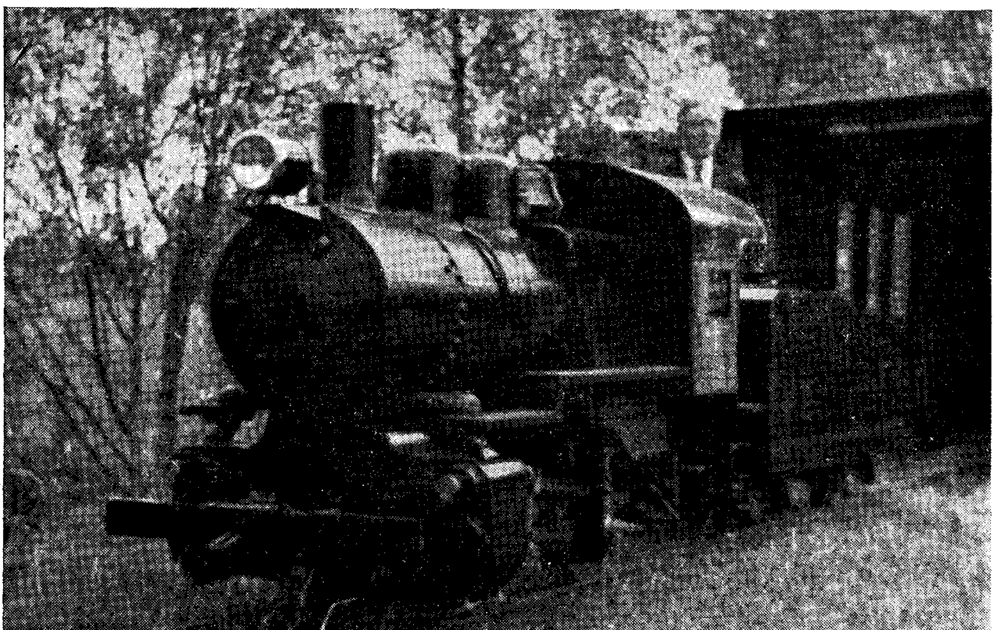


Photo by] [*R. S. Hill*

Mr. R. H. Morses's 15-in. gauge American switcher

ney casting between the two halves, with the cap and base projecting from each end; grip the lot in the three-jaw, curved end outward, and bore to a fairly tight fit on the liner, using the same "technique" as for cylinder boring. The curved base can be trued up on a bit of emery-cloth, as mentioned above.

The outside of the chimney can be turned on a mandrel, which may either be solid rod, or tube. I have a few mandrels which fit between centres, and they have a very slight taper, which enables them to be driven tightly into whatever is going to be operated on; but a bit of ⅝-in. rod or tube, with a piece of foil, or even paper wrapped around it so that it fits tightly into the bored chimney, will do. It can be held in three-jaw, chimney cap outwards. A round-nose tool will do the needful on the cap and barrel, and a knife tool will attend to the lip at the top; the base cannot be tool-finished, owing to its irregular shape; but if you hold a half-round smooth file against it as it revolves, and then a bit of fine or medium emery-cloth, all traces of the casting skin will soon be removed. No fixing is required for the chimney; just push it over the liner. If the casting is good gunmetal, the polished top will go a lovely golden colour when the engine is put in steam, and the chimney becomes hot.

Well, that settles one "missing link"; there are one or two other points to deal with, also painting; and instructions on steaming up, and driving, are also asked for. I hope to deal with them all. Meantime, from correspondence received, it seems that many new readers are unaware of the fact that full-sized blueprints of *Tich*, including all details, are available from our offices, and I would strongly advise all tyro builders to obtain a set. It is far easier to grasp the size and shape of any component, from the full-sized drawing, than from a reduced illustration necessitated by the size of the pages of this journal. Also, you have the whole thing at your fingers' ends, in a manner of speaking, instead of having to refer to back issues.

Another "Big Little 'Un"

There are very few readers of this journal who would tackle a 15-in. gauge locomotive, but my old friend and fellow-conspirator of the L.B. & S.C. Railway has done it, with the result you see in the picture. The smiling face over the top of the cab belongs to the culprit, Rob Morse, of Repps, near Potter Heigham, Norfolk. Talk about a sockdolager for the "OO" gauge fraternity—!! Rob and his three sons run a caravan camp at Repps, and the 15-in. gauge railway will be an added attraction. The Morses love big things; Den uses a full-sized steam tractor for shunting the caravans, and they have two motor cabin cruisers on the river at the bottom of the garden, whilst Bob, the youngest son, has purchased a once-derelict full-sized windmill, and put it into working order—some job, that! It is also proposed to install a multiple-gauge continuous track for any holiday-campers who care to bring their locomotives along.

Hitchin M.E. Club Enjoys Itself!

(*Continued from page* 351)

loaned by Mr. Church, of Henlow Village, Beds, and this supplied the motive power.

Improvisation came into its own on this construction job, as time was a vital factor. The chimney was constructed from a disused air duct, and a bottomless wash basin; the dome was constructed on the bird-cage pattern then covered with paper and paint, the whistle from a cardboard tube on which was mounted a steam boiler alarm whistle. Gallons of paint were lathered over the work (and the builders) and final finish was done by home-sprayer units.

The coaches were built on farm trailers loaned for the occasion by Messrs. L. Franklin and A. Weedon, and as many as a dozen club members were on painting duties during the last fortnight. As only the front, left side and rear views were required, only one half was completed, and full effects were provided by a member's model vertical boiler mounted on the off-side slightly to the rear of the smokebox, with a flexible tube taking the smoke to the chimney. Steam at 40 lb. per sq. in. was taken to the cylinder positions, the dome and the whistle, which was controlled by a valve on the footplate. Smoke was produced by burning small pieces of roofing felt.

The "Olde Monster," as it became affectionately known to club members, went through ten performances, the first being graced by the presence of Her Majesty the Queen, whose pleasure and amusement was apparent to all.

At no time was much maintenance necessary, but in accordance with the script, the rear coach had to be uncoupled; this was accomplished by withdrawing the extended coupling-pin from inside the first coach, no mean feat when one realises that the track was a gravel road with a down gradient, and the coaches loaded with passengers in traditional dress.

The club feels that its efforts have been a great success, in the construction, staffing and operation, described in the local Press as "The most astonishing realistic train" and by the Pageant committee chairman and various local dignitaries as "the main feature" in the Pageant.

Although some criticism may be levelled at us, the job has been an interesting and unusual departure from normal club activities, which, incidentally, were carried out at the same time. While the final Saturday's two Pageant performances were being held, the club's model passenger track was in operation at the Lister Hospital, entertaining those who could not see the Pageant, due to illness or duty.

Novices' Corner

A Lathe Tool Honing Jig

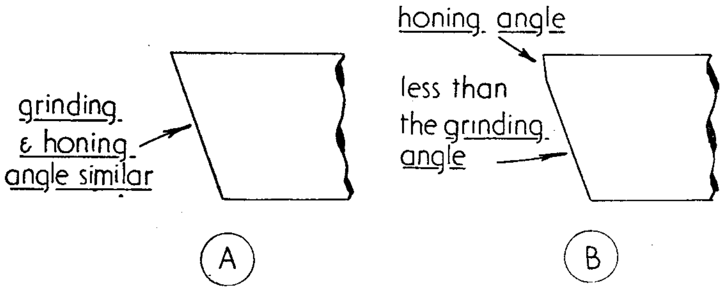


Fig 1. *Less honing required if the honing angle is less than the grinding angle*

AFTER a lathe tool has been ground on an abrasive wheel, the cutting edge formed, although seemingly sharp, will be somewhat rough, particularly where a wheel of coarse grit has been used.

It is, therefore, customary in the small workshop to finish the ground edge by honing the tool either on an oilstone or on a carborundum stone of fine texture. Not only does this honing process give a sharper edge, but, in addition, the small irregularities left by the grinding wheel are smoothed off and a stronger and more durable cutting edge results.

Free-hand honing of the tool on the oilstone, unless skilfully carried out, is apt to alter the angles ground at the tip and so may reduce the rake or clearance necessary for satisfactory cutting.

A simple form of jig to position the tool and guide the stone will overcome some of these difficulties and will enable the front cutting edge of the tool to be quickly and accurately finished.

Now, if the front clearance of the tool is ground to an angle of 10 deg. and the honing jig is made to work at a similar angle, it will be clear that, as represented in Fig. 1A, much honing will be required to smooth the whole of the front face of the tool. Instead, the angle of honing is made, say, 1 deg. less than the angle of grinding, and the honing is then confined to a very small area of the tool's surface, as illustrated in Fig. 1B.

A further advantage of this method is that the tool can generally be quickly resharpened a number of times before grinding again becomes necessary. A convenient form of jig is illustrated in Fig. 2, where it will be seen that the tool lies on a flat base and the stone, as it is moved to and fro, is guided by two steel side plates. On its under side, the base is furnished with an inset metal plate for clamping the jig to the bench with an ordinary C-clamp.

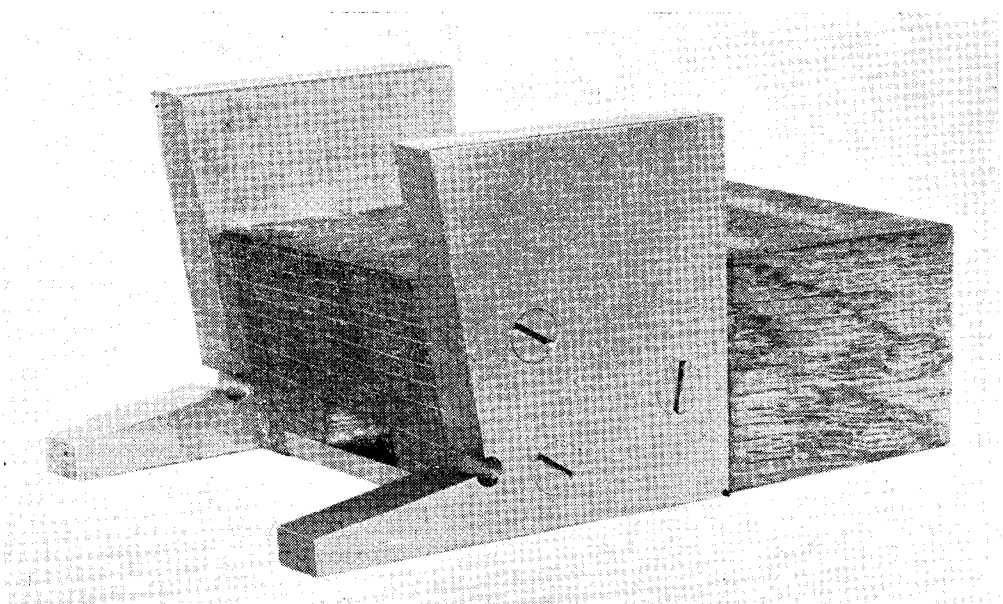


Fig. 2 *The finished honing jig*

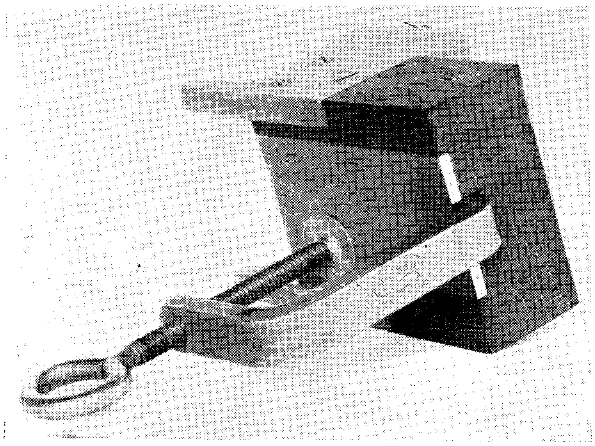


Fig. 3. Showing the bench clamp in position

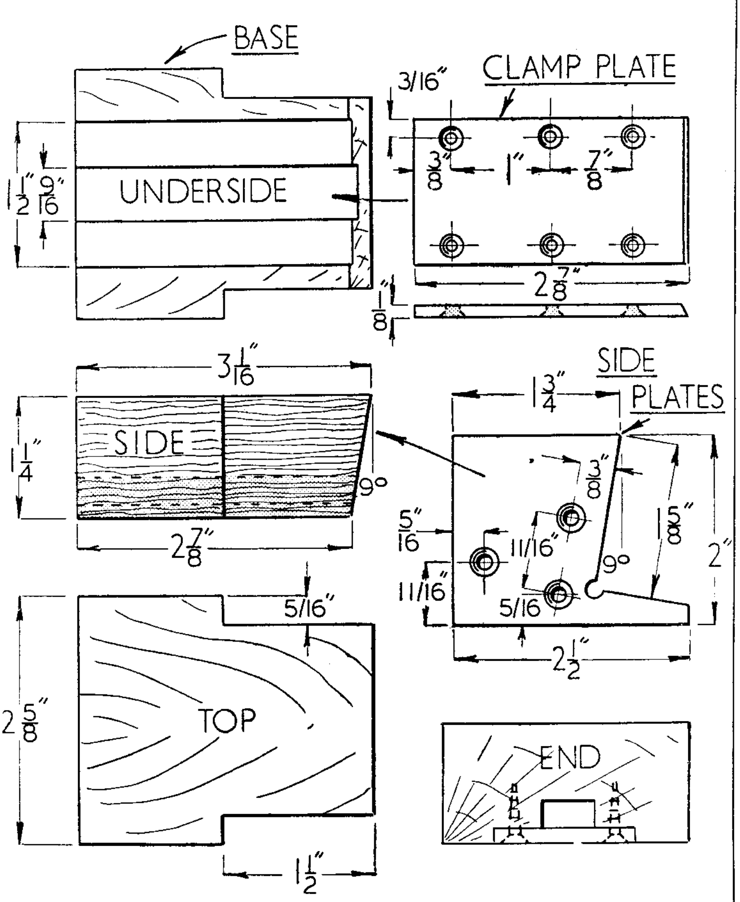


Fig. 4.

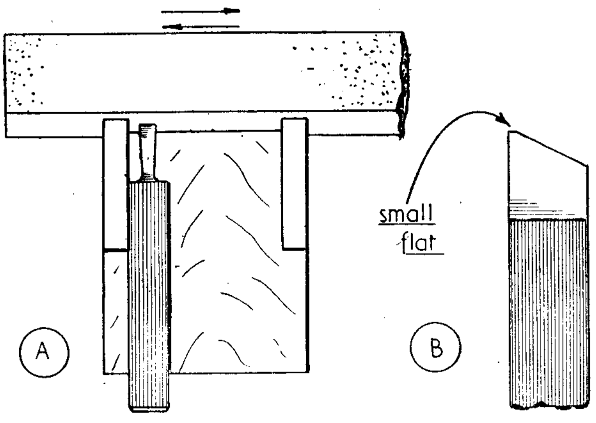
Construction

The base can quite well be made of hard wood and, as shown, the under surface is double grooved to form a passage for the limb of the clamp, and also to allow the clamp plate to be fitted flush with the surface. The actual size of the base is unimportant, but, as will be seen later, there should be room for the tool to be swung from side to side when held against the stone. The thickness of the mild-steel strip used for making the side plates is also unimportant, as long as there is a sufficient thickness of metal in contact with the stone to resist wear. After the side plates have been sawed and filed to shape, and the screw holes have been drilled and countersunk, these parts are firmly clamped in position on the base. Next, the holes for the wood screws are drilled in the drilling machine to ensure correct alignment, so that the plates are not pushed out of position when the screws are tightened. When clamping the side plates in position, it is best to rest the base on the surface plate to make sure that the parts are properly in line before the base is drilled for the wood screws. After assembly, the jig should lie flat on the bench without rocking and, at the same time, the stone should be tried in place so that any small errors can be corrected by filing the guide surfaces of the side plates to give the stone an even bearing.

The Jig in Use

As the area of contact between the tool and the stone will be only along a narrow line, it is advisable to use a stone of hard texture that is not easily grooved or scored.

The hard variety of Arkansas oilstone is very resistant to wear and imparts an extremely smooth sharp edge to the tool, but an India stone of fine or medium grit has been found suitable for use in the jig owing to



its rapid cutting and good wearing qualities.

The most convenient size of stone is the standard bench stone measuring 8 in. × 1 in. × 2 in.

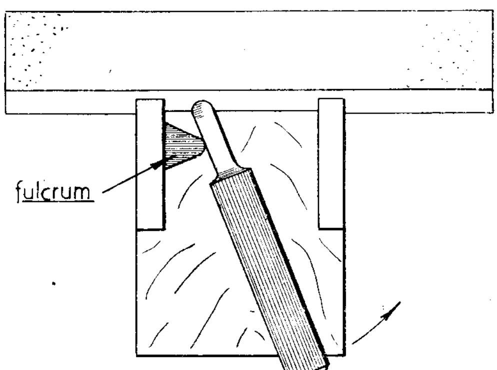
The edge of a parting tool can readily be honed square with the shank by holding the tool against the side plate of the jig, as shown in Fig. 5A; the tool is then pressed lightly forward against the stone, and the stone is worked backwards and forwards while in contact with the guides. The small flat formed at the tip of a knife tool, in order to give a good finish to turned work, is honed in an exactly similar manner.

The method of honing tools with a rounded point is illustrated in Fig. 6. Here, a piece of metal or wood is placed against the side plate of the jig to form a fulcrum for the tool, as the shank is moved along a curved path during the passage of the stone.

To hone an even curve on the cutting edge may at first be found a little difficult, but with practice good results will be readily obtained.

Left—Fig. 5. A—honing a parting tool; B—the tip of a knife tool is honed in the same way

Below—Fig. 6. Method of honing a round-nosed tool



For the Bookshelf

Miniature Landscape Modelling, by J. H. Ahern. (London: Percival Marshall & Co. Ltd.). 133 pages, size 6 in. by 9 in. Price 10s. 6d. net.

Scenic modelling, as a branch of the craft, has, in recent years, attracted more and more adherents, and the time has come when advice and guidance by a well-known expert seems desirable, if not necessary to help newcomers to avoid making wrong starts.

Admittedly, the subject is a very wide one, the range extending from the essentially elaborate educational, landscape models found in museums and technical institutes to the simple, but attractive displays seen in the windows of travel agents' offices. Perhaps it is the model railway builder who, among hobbyists, has developed scenic modelling to the highest degree; but his methods can be easily applied to scenic models for other purposes, often with very charming effect.

This book contains a fund of information, systemmatically and progressively arranged, illustrated by numerous clear diagrams and drawings, as well as by many photographs that are a delight to see. The author's text is light in style, stimulating and easy to read; he is the builder and owner of the Madder Valley Railway, a 4-mm. scale "light" railway which, in itself, is a masterpiece of fascinating scenic work, captivating alike in its simplicity, accuracy and charm. His book gives delight as well as instruction in a supremely pleasing branch of model making that is by no means inherent to model railways alone.

A Self-Feeding Suds-Brush

by Lawrence H. Sparey

THE importance of a plentiful supply of the correct cutting lubricant—especially when turning steel—is well known to all amateur engineers; yet, strangely enough, there exists a certain difficulty in fulfilling this apparently simple requirement. Mechanical "suds pumps," such as are found on capstan lathes and other professional machinery, are not often practicable in a small home workshop, even if only for the reason that such pumps usually make a considerable mess in the vicinity of the lathe.

Nor does the simple "drip-can" entirely meet the case, for to be efficient the lubricant should run pretty freely, and this necessitates some draining arrangement in the lathe tray. It is for these reasons that the "suds-can-and-brush" have been the mainstay of the amateur turner for so many years, and their limitations are, therefore, so well known as to need no enlargement here.

These are particularly evident when a long cut is in progress, for even the most satisfactory brush cannot hold lubricant for a long period, nor supply it in sufficient quantity to be effective.

These considerations led me to thoughts of combining the good qualities of both the drip-can and the suds-brush methods; with such satisfactory results that the simple solution of the trouble may be worth passing on to others. As may be seen from the photograph (Fig. 1) the idea consists in supplying a brush with a flow of cutting lubricant from a can suspended above—the two being linked with a short length of rubber tubing.

Suds brushes wear out pretty rapidly, so in order that they may be replaced with the minimum of trouble, it has been arranged that the wooden handle of the brush should be cut short, and plugged into a tubular metal handle. The drawing (Fig. 2) shows the arrangement, and it will be evident that the metal handle consists simply of a suitable length of brass tubing, into one end of which a hollow brass bush, or nipple, is soldered. The other end of the tubing is left open, in order that the shortened handle of the brush may be forced in.

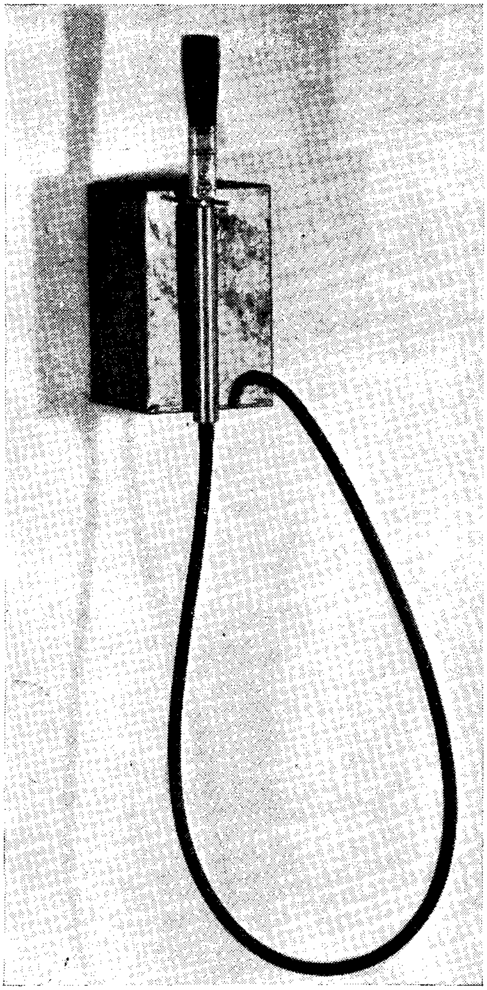


Fig. 1

The brush handle, it will be noted, is drilled through the centre, so that the cutting lubricant—usually soluble oil—may reach the hair. This drilling may be done with a hand-brace.

Any suitable tin can may be used as a container. No drawing is necessary, as all that has to be done is to solder in a short piece of tubing as an outlet near the bottom, and to provide a clip for the brush somewhere near the top. A

(*Continued on page* 362)

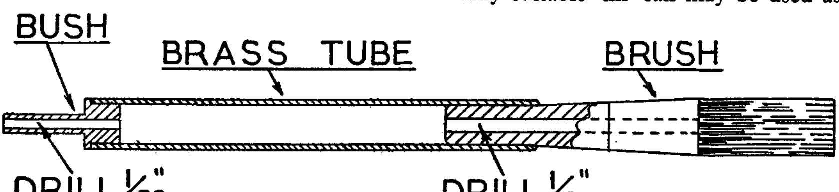


Fig. 2

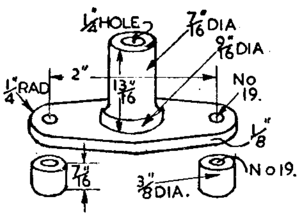
*A Chiming Gear

for the Battery-Driven Electric Clock

by C. R. Jones

TO make the bearing for the control disc, a piece of $\frac{5}{8}$ in. diameter brass rod was silver-soldered to a piece of $\frac{1}{8}$ in. thick brass, and then set up in the lathe and drilled and reamed with a $\frac{1}{4}$ in. diameter hole, the rest being turned and finished to the sizes shown.

This bearing is mounted on two distance-pieces made of brass and held to the baseplate with two set-screws.



BEARING FOR CONTROL DISC.

Chime Drum

In the present case this was turned from a length of bronze which happened to be available, the centre portion being finished turned to $\frac{13}{16}$ in. in diameter by $1\frac{1}{16}$ in. long. The end portions were then turned down to $\frac{9}{16}$ in. diameter. It was then drilled right through and reamed to $\frac{1}{4}$ in. diameter.

While still in the lathe, four lines were marked round the outside $\frac{1}{4}$ in. apart, as shown, using a pointed tool. A fifty-tooth change wheel was then placed on the tail end of mandrel, and taking every second tooth, twenty-five lines were marked longtitudinally, as shown, with the pointed tool on its side for this operation.

The chime drum was then parted off.

The positions for the operating pins were next marked off with a sharp centre punch, as per the diagram for " setting out the chime drum," and a mark was made on the drum to indicate the starting point of the chimes.

It will be noticed that every fifth line has no pins, which gives the spacing between the chimes.

The holes for the pins were drilled to a depth of 7/32 in. with a No. 43 drill, and a sufficient number of pieces of 3/32 in. diameter silver-steel were cut off slightly over $\frac{3}{8}$ in. long.

One end of these were chamfered off slightly to give them a start, and they were then driven into the holes in the drum with a light hammer, and were a good tight fit.

After this operation, the drum was mounted in the lathe on a true-running mandrel, and with a keen tool, and with the lathe running at a fair speed, light cuts were taken off the pins until the amount projecting from the face of the drum was 5/32 in., and they had all been trued up by the lathe tool. The pins were then all carefully filed off at an angle as shown, leaving a portion in the centre about $\frac{1}{16}$ in. in width.

A hole had been drilled in the top end of the drum, and tapped for a No. 3 B.A. grub-screw, as shown.

Control Disc

This was made from a piece of 3/32 in. thick brass plate, and had a piece of $\frac{5}{8}$ in. diameter brass rod silver-soldered to the centre of it. It was then turned up to the sizes shown, and while still in the lathe and with a fifty-tooth wheel on the tail end of mandrel, the slots were cut about $\frac{1}{16}$ in. in width and about $\frac{1}{8}$ in. in depth. The first quarter occupies 1/10th of the circumference, the second quarter 1/5th, the third quarter 3/10ths, and the fourth quarter the remaining 2/5ths.

These slots were cut with the cutter frame and flycutter. The boss of the control disc was also fitted with a No. 3 B.A. grub-screw.

Four pins were also fitted to the control disc, where shown on the drawing. These are for the purpose of unlocking the locking catch, when the control disc has moved sufficiently far for the hacksaw insert in the end of control lever to drop on to the edge of the disc instead of dropping back into the slot and so cutting the current off from the motor before the chime has finished playing.

In the present case these were not really pins, but short No. 8 B.A. set-screws, screwed into tapped holes in the disc from the rear.

Hammer Heads (Four Off)

The hammer heads were made from $\frac{5}{16}$-in. square brass rod, which was set up true in the lathe, and drilled to a depth of $\frac{1}{2}$ in. with a tapping size drill for No. 6 B.A. This hole was then opened out to $\frac{3}{16}$ in. diameter for a depth of $\frac{1}{4}$ in., and this end was then turned down to 9/32 in. diameter for a length of $\frac{1}{16}$ in.

The hammer head was then parted off $\frac{1}{2}$ in. in length, the parted off end being afterwards slightly rounded. The small hole was tapped No. 6 B.A. for setscrew, and a $\frac{1}{16}$ in. diameter transverse hole drilled as shown to accommodate the hammer shaft.

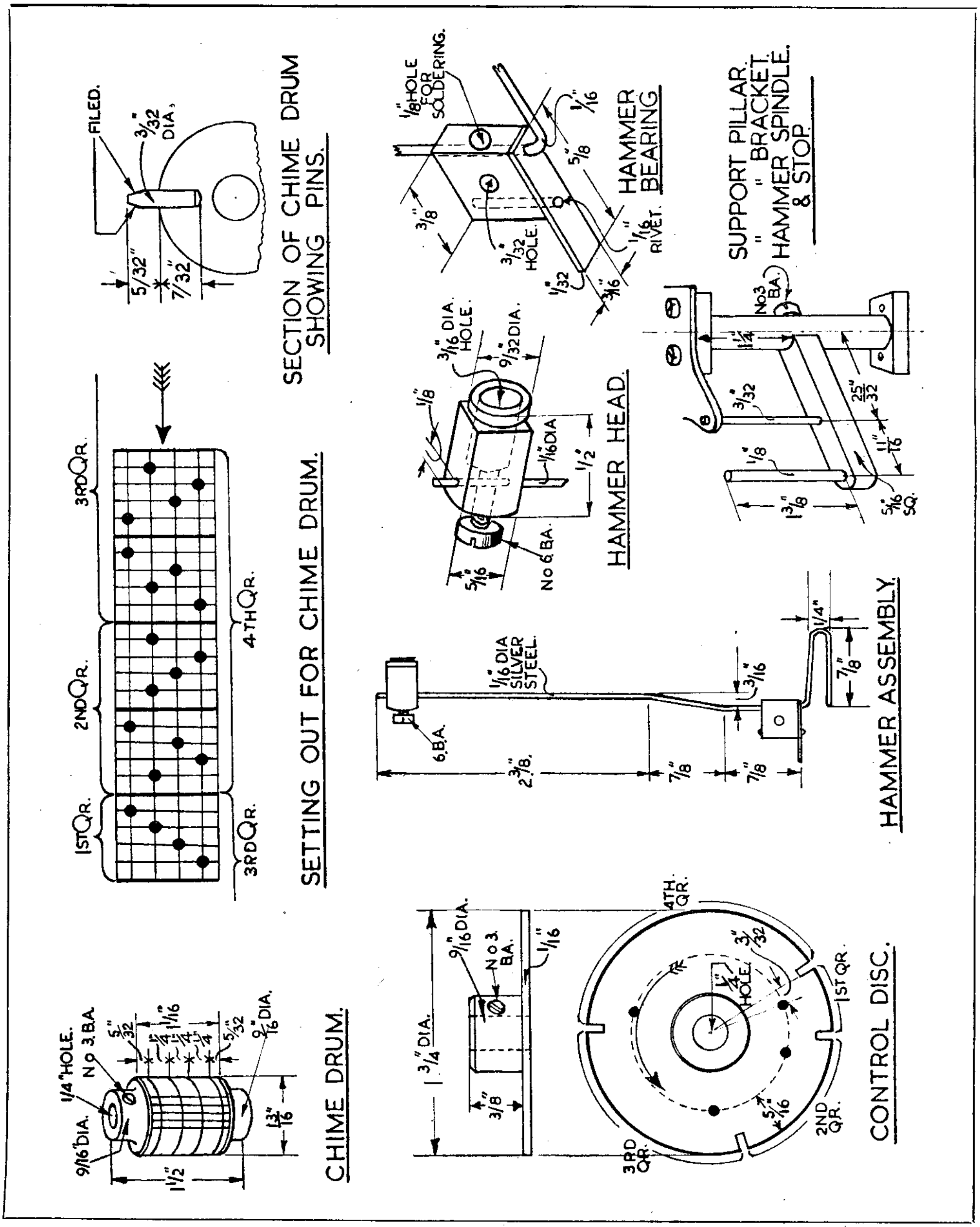
The $\frac{3}{16}$-in. holes in hammer heads were fitted with either plugs of hard leather, or fibre, which was left projecting about $\frac{1}{16}$ in.

Hammer Bearings (Four Off)

The hammer bearings were made from $\frac{3}{8}$-in. brass rod, which was set up in the lathe, and drilled with a 3/32 in. diameter drill for a depth

*Continued from page 322 " M.E.," September 6, 1951.

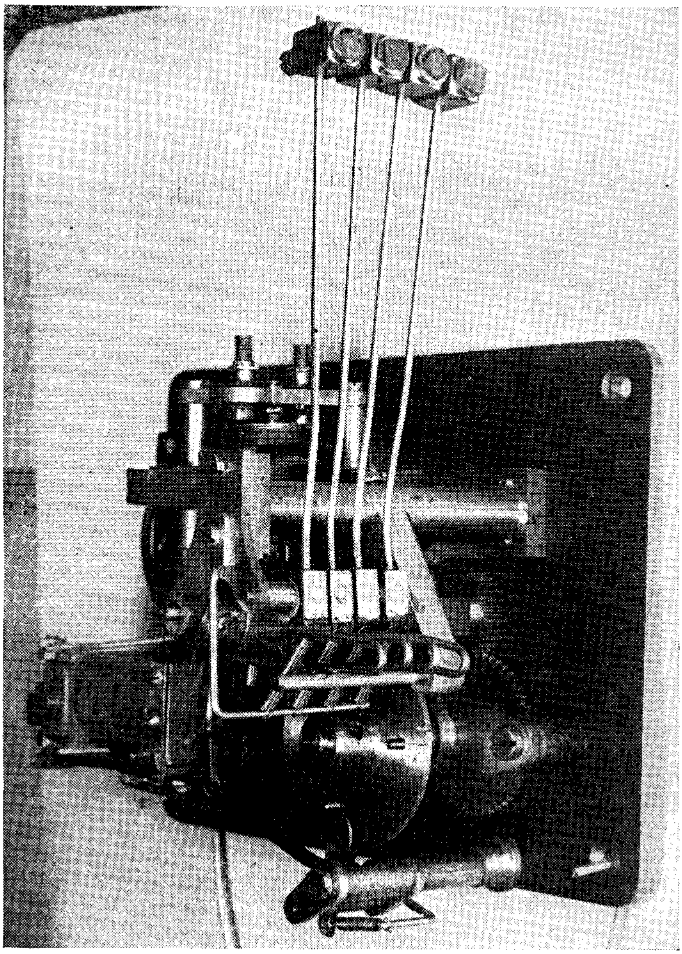
of about one inch. Four slices were then parted off $\frac{3}{16}$ in. thick. Each piece was drilled with two $\frac{1}{16}$ in. diameter holes as shown, one hole being into the hammer shaft hole, and is for purpose of easy soldering of the hammer shaft into position.



for the hammer shaft, and the other for the rivet which holds a piece of softened hacksaw blade $\frac{5}{8}$ in. long and $\frac{3}{16}$ in. in width, in position at one end. Another hole is shown, and this is a $\frac{1}{8}$-in. hole which is drilled where shown just

Hammer Shafts (Four Off)

These were made to the dimensions shown, from $\frac{1}{16}$ in. diameter silver-steel, the tail ends being bent to shape first, and the long portion pushed through the accommodating hole; when



Photograph No. 5. View looking at chiming gear from the right-hand side

in the correct position, they were carefully soldered into place, using the aformentioned hole to give the solder easy access, and make a clean job.

The shafts were later bent to suit the positions of the tuned rods and also to clear the support-pillar.

Support Bracket

This is shown on the drawing, and can also be best seen in photograph No. 5. Also, the tail ends of the hammer shafts can be seen resting against the stop pin.

This bracket was made from a length of brass $\frac{5}{16}$ in. square, to the dimensions shown, one end being hollowed out to be a good fit up against the $\frac{3}{8}$ in. diameter support pillar, and being securely fixed to this by means of a No. 3 B.A. setscrew.

The 3/32 in. diameter hole in this bracket was set in line with the 3/32 in. diameter hole in the top bearing for the chime drum, and was fitted with a length of 3/32 in. diameter silver-steel as a spindle for the hammers. Distance washers were made to separate the hammer bearings, and to bring the operating pieces of steel riveted to the bearings central with the pins on the chime drum, when in position.

The hammer stop was just a short length of $\frac{1}{8}$ in. diameter brass rod, pressed tightly into the bracket.

(*To be continued*)

A Self-Feeding Suds-Brush

(*Continued from page* 359)

hole in the back of the can, near the top, enables it to be secured to the wall with a wood-screw. No elaborate brush clip is necessary. My own consists simply of two 4-B.A. screws, nutted side by side in the wall of the can, so as to provide a prong into which the brush may be placed.

In thus hanging-up the brush, one does, of course, automatically cut off the supply of lubricant, so that no on-off tap is required. The rate of feed may be adjusted once and for all by nipping the end of the outlet tube, from the can, until a suitable flow is obtained.

The whole outfit is so absurdly simple that there is hardly anything further to be said about it, but it may be pointed out that the outlet tube should be soldered about $\frac{1}{2}$ in. up from the bottom of the can, in order to form a sort of well into which anything likely to obstruct the flow may fall.

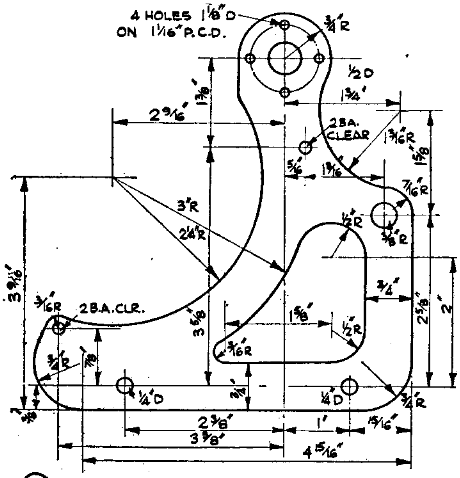
The rubber tube, which may be readily obtained from any aquarium shop, should not be too long, but long enough to give free movement of the brush in the positions in which it is likely to be wanted.

PETROL ENGINE TOPICS

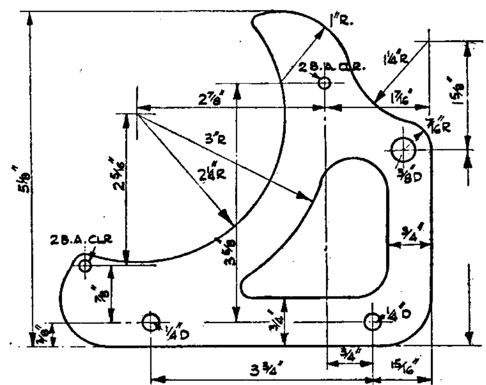
*A 50-c.c. Auxiliary Engine

by Edgar T. Westbury

BEFORE making any attempt to construct the bracket, the cycle to which it is to be attached should be examined to see if any modifications are necessary or desirable. Some cycles have a very limited length of rear stay available between the wheel and the saddle bolt, which may necessitate placing the clamps closer together, and possibly altering the shape of the side plates; it is, however, generally desirable to keep the clamps as far apart as possible to ensure stability of the mounting. If caliper brakes are fitted to the cycle, it may be necessary to modify the method of their attachment, or alter the frame to accommodate them.



(1) MOUNTING PLATE - R.H. - 1 OFF. 6 G. DURAL OR 10 G. M.S.



(2) MOUNTING PLATE - L.H - 1 OFF.

The side plates are specified as being made either in mild-steel or duralumin. Other materials are practicable, but pure aluminium or its softer alloys are not advised. Cast side members in a good quality alloy may, however, be used, but they should be not less than 1/4 in. thick in the main section, and instead of being pierced for lightening, as shown, a recessed panel not less than 1/8 in. thick should be formed. It may be mentioned that a cast aluminium bracket, in one piece, has been designed, and is quite satisfactory on some types of cycles, but is not sufficiently adaptable for recommendation as a standard feature.

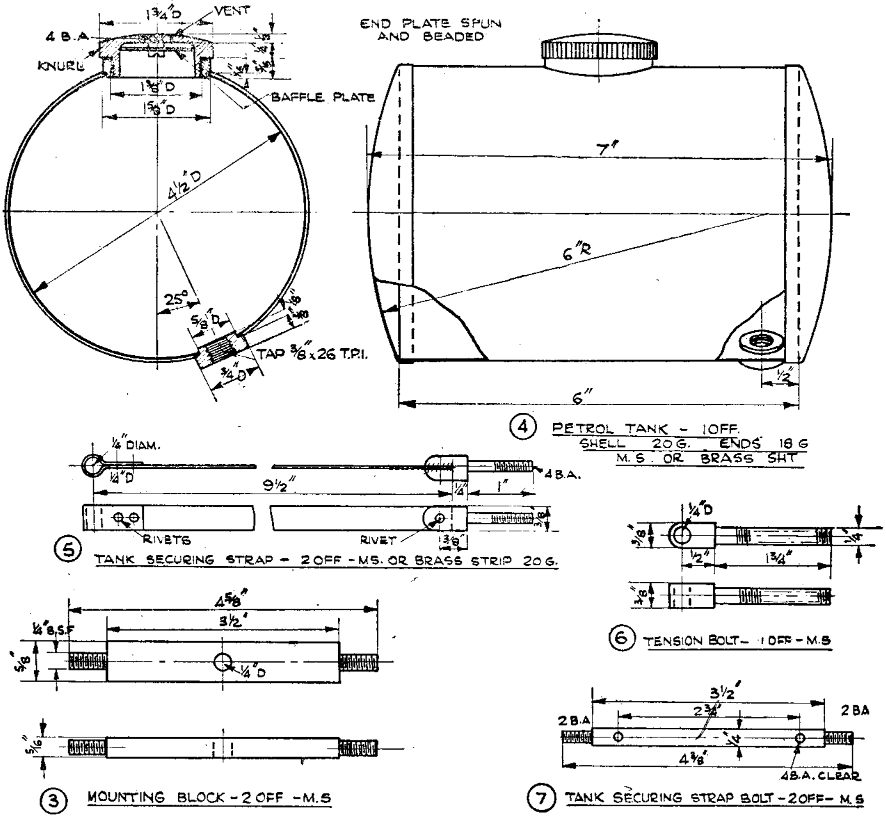
Two cross-members (described in the detail drawings as "mounting blocks") are made from mild-steel; duralumin is permissible if the thickness is increased to 3/8 in., and the screwed ends to 5/16 in. These members are mounted in the four-jaw chuck, or marked out and drilled at each end for mounting between centres, for machining these extensions. It is important that the ends should be in true alignment, and that the distance between the shoulders should be the same for the two members, within fairly close limits. As already mentioned, it may be found desirable to modify the distance apart of these two members in the side plates, and it may also be mentioned that in many cases, the use of studs, tapped into the centre hole in each member, is preferable to bolts for securing the clamps. The latter are not drawn in detail; they may be simply flat steel plates about 1 in. by 1/4 in., long enough to span the stays, but clamps made of angle section steel or dural, notched out to fit the stays (note that the latter usually taper, so that the two clamps will have to be individually fitted), are much more rigid and provide more positive location, so as to prevent risk of slipping.

The cross-bolts for securing the tank straps call for little comment, except that only one of them need be cross-drilled, and that one may with advantage be made either larger in diameter or of square section. The tank straps are made from mild-steel or brass strip (baling strip is quite suitable material) and one end of each bent

*Continued from page 302, "M.E.," August 30, 1951.

round to form an eye, secured by two 3/32-in. rivets. Round mild-steel bar, $\frac{3}{8}$ in. diameter, may be used to make the tension bolts, which are turned down to 9/64 in. on the end and screwed 4 B.A., the other end being cross-drilled 3/32 in. diameter and slotted axially with a hacksaw or circular slitting saw. Before riveting these

grained hardwood, which should be attached to the faceplate by wood screws from the back, so as to ensure rigid support. The surface should be finished as smooth as possible, and a wood which takes a good natural finish from the tool, such as beech, is therefore desirable. A wooden backing pad, not less than about 2 in. diameter, and



(4) PETROL TANK – 1 OFF. SHELL 20 G. ENDS 18 G M.S. OR BRASS SHT

(5) TANK SECURING STRAP – 2 OFF – M.S. OR BRASS STRIP 20 G.

(6) TENSION BOLT – 1 OFF – M.S.

(3) MOUNTING BLOCK – 2 OFF – M.S.

(7) TANK SECURING STRAP BOLT – 2 OFF – M.S.

permanently to the ends of the straps, they should be tried out with a temporary bolt or pin, as the straps are often found to stretch under tension. Sweating with soft solder, in addition to riveting, is advisable for final fixing.

Fuel Tank

If the cylindrical form of tank is to be used, it is recommended that the ends should be formed by spinning, which is quite easily carried out on the lathe, though workers with no previous experience of this technique may find it advisable to practise on some odd pieces of sheet material before attempting the actual work. The material should be well annealed, and in the case of brass, it is important that it should be of the right grade for working in this way, as some kinds of brass are inherently brittle, and very liable to develop cracks, however thoroughly or frequently annealed.

A former should be turned to the internal contour of the end plates, from a piece of close-

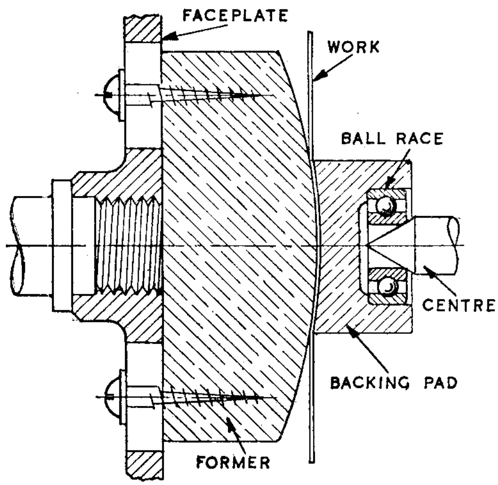
shaped to fit the centre of the former, is used to support the work, with the aid of the back centre, which should preferably be of the ball-bearing type to reduce friction. Few model engineers, however, possess a centre of this type, but a good substitute may be improvised by recessing the back of the pad-piece to take an ordinary ball-race, having a centre bore suitable for resting on the cone of the lathe centre, as shown in the drawing.

A hand-rest should be rigged on the cross-slide of the lathe, having a row of holes in the top surface to receive a pin, which is used as a fulcrum to provide sufficient leverage for working the material with the spinning tool. The latter is in the form of a long-handled burnisher, and may be made from an old file, by grinding the teeth away near the end, and carefully rounding off all edges, as shown in the drawing. The working surface should be finished to a high polish, and dead hard, so that it will not " pick up " or score the metal. Preliminary shaping of spun work is

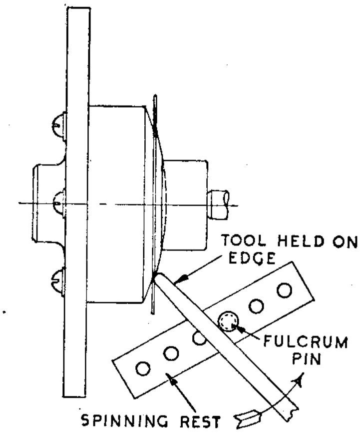
often carried out by wooden tools, but beginners generally find it easier to work with hardened burnishing tools, which are in any case desirable for finishing the formed surface.

The discs for the endplates should be about 5 in. diameter, which is less than the area of the

lubricant, such as soap or tallow, should be smeared over the exposed surface of the disc, and with the lathe running at top speed, the burnishing tool is used to force the metal to the shape of the former, working from the centre outwards. The beginner will be inclined to under-



Former mounted on faceplate, with supporting pad on tailstock centre

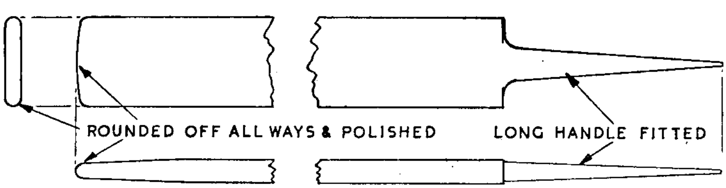


Plan view, showing spinning rest and tool in position

full projected surface, but the metal will stretch fairly considerably in the course of working, and some trimming of the edge will usually be found necessary when the endplates are finished. In the case of brass or copper, the discs should be annealed by heating uniformly all over to redness and quenching out in water. Steel endplates are not easy to form on a light lathe, as they require more force to deform them and are therefore liable to impose undue load on the mandrel bear-

estimate the amount of pressure required to do this, and will very likely harden up the metal by surface friction before any noticeable progress is made in forming it. A sheet of 18-gauge brass will probably require as much force as can be obtained with a tool having a leverage of 12 in., against a fulcrum pin suitably located to use this leverage to the best advantage.

If the rectangular form of burnisher, as des-

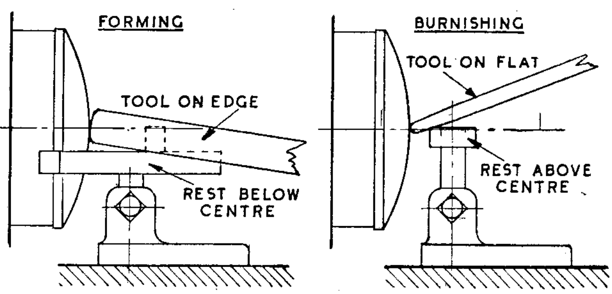


(Left) Form of burnishing tool recommended

(Below) Positions of tool for forming and burnishing respectively

ings; but if they should be used, note that they should be cooled as slowly as possible, by burying in ashes or lime, for annealing, in contrast to the rapid cooling in the case of brass or copper.

With the former and pad-piece mounted in the lathe, the disc to be formed is gripped lightly between them by adjusting the back centre, and set to run truly over the outside edge by tapping with a mallet. The pad-piece is then forced up to deform the centre of the plate and hold it in close contact with the former. A tenacious



cribed above, is employed, it will usually be found desirable to use it with the edge vertical for the main forming operation, and on the flat for finishing, the fulcrum pin being dispensed with in the latter case. Some workers may prefer an oval section or spherical burnisher, but this is largely a matter of individual preference, and I have generally found the rectangular type easiest to use on straightforward work of this nature. Always be sure that a film of lubricant is maintained on the work—oil is quickly thrown off by centrifugal force and is both messy and inefficient, hence the preference for solid lubricants. As soon as the metal hardens up under the tool, re-anneal it before proceeding further, or it will buckle and wrinkle or possibly crack, instead of lying down smoothly on the former.

Having formed the convex end surface, the fulcrum pin is shifted near the end of the rest, almost in line with the corner of the former, and with the tool still on edge, the rim can be formed. In these operations, the tool should be held more or less horizontal or with the handle slightly low. The work will fit the former closely enough to allow of removing the backing pad, and the burnisher can then be used to planish the surface to a high polish, the rest being set well above centre and the handle held high to obtain leverage against the edge of the rest.

Finally, the edge of the rim should be trimmed with a left-handed knife tool and all burrs removed. It will probably be found that some force will have to be used to remove the work from the former, the best way being to use a chisel against the edge, with a block of wood on the faceplate to serve as a fulcrum, and work gradually all round the rim, to avoid marking or distorting the finished work.

I have been at some pains to describe this spinning operation in detail, because the technique is not very well known, and it deserves far more attention in the home workshop than it has hitherto received. The forming of a pair of tank ends is about the simplest spinning job one could tackle, but it is excellent practice, and serves well as a preliminary exercise if one decides to attempt more elaborate work later one.

Tank Wrapper

This can be bent from sheet metal, taking care to avoid kinks, and the joint may be made by any sound mechanical method, such as by lapping and riveting, or seaming, sweating with soft solder afterwards to ensure that it is leakproof, in either case. Seaming calls for the use of a special tool, well known to tinsmiths, and it should be noted that the bulge of the seam should be inwards, so as not to interfere with the fitting of the endplates. Those who are skilled in coppersmithing and take a pride in their craft may prefer to make a dovetailed joint and braze or silver-solder it so that it is practically invisible. A sound structure is essential for the tank as it will have to stand a great deal of vibration, but provided that all the parts are well fitted, and there are no large gaps to fill up, soft solder well sweated in is quite satisfactory for securing the endplates and the bushes for the tap and filler cap. The seam of the wrapper, if visible, should be disposed so that it is not conspicuous; the filler cap is shown in the centre, though it may be found more convenient to locate it at one end, and the tap should obviously be at the end adjacent to the carburettor, and located at the lowest point of the tank.

The form of tap which has been found most satisfactory is the sliding cork-seated type, though the more orthodox taper-plug type is cheaper and easier to obtain. It should be fitted with a cylindrical gauze filter to project inside the tank, where it will always be washed clean. The feed pipe to the carburettor must be flexible, to allow for the movement of the engine, and the most suitable material is "P.V.C." or synthetic rubber; do not on any account use ordinary rubber, or it will cause endless trouble by reason of small particles dissolving away and blocking the carburettor jet.

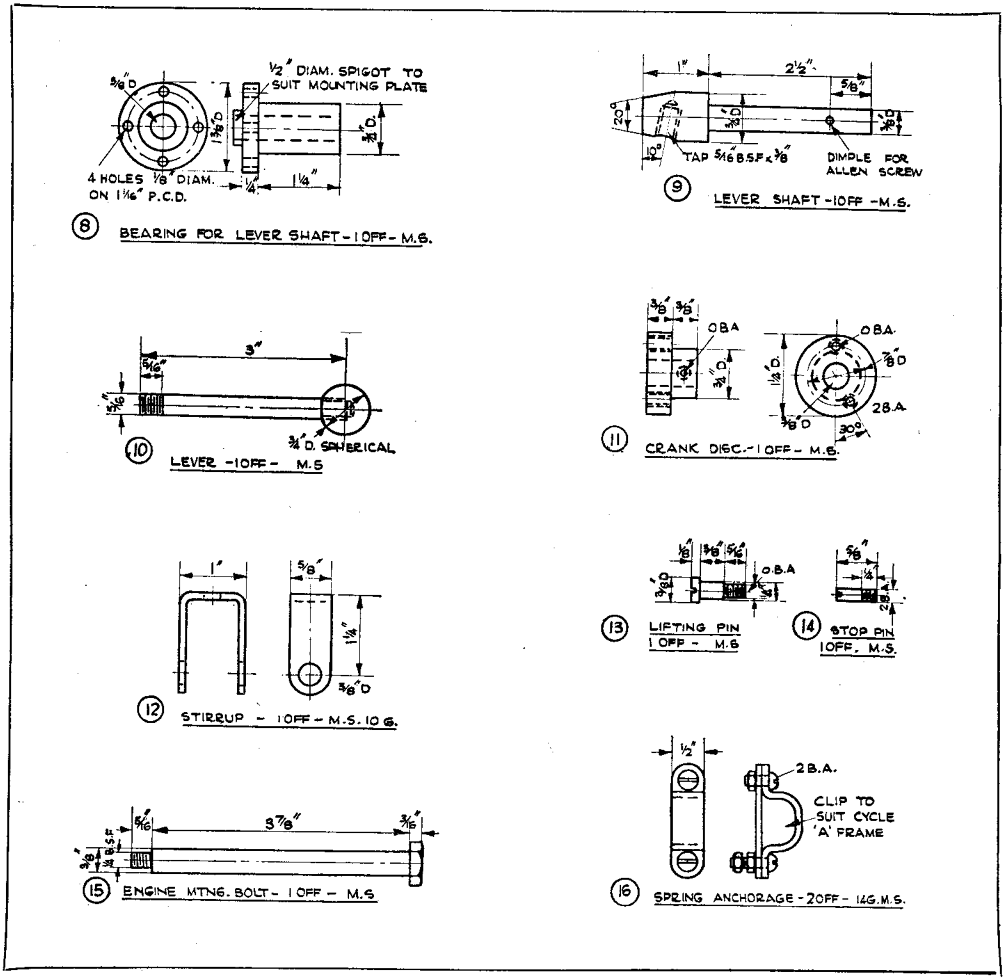
No exact details are shown of the filler cap construction, as any type of cap which is sound in design, ample in size, and properly air-vented, may be used. The example shown was machined from solid duralumin and screwcut 20 t.p.i., the bush being of brass to enable it to be soldered to the tank. An anti-splash baffle was fitted inside the cap, having just sufficient clearance, round the edge to allow air to pass, and two No. 60 vent holes were drilled in the top of the cap itself.

When the tank is strapped down to the bracket, it is advisable to cement two strips of $\frac{1}{16}$ in. rubber to the top edges of the plates to prevent chafing, and a turn of rubber tape round the tank, under each of the straps, will help to keep it secure without undue stress in tightening the latter.

Disengaging Gear

The operation of this is quite simple to follow, and its construction is equally straightforward. First the bearing for the lever shaft should be made either from mild-steel, duralumin or brass, and screwed or riveted to one of the plates of the mounting bracket. The lever shaft should preferably be machined from one piece of mild-steel, as shown, and the cross-hole for the lever drilled and tapped at an angle of 10 deg. Both ends of the lever are screwed, one to fit tightly in the above hole, and the other to take an ebonite or plastic knob. A fine thread, say 26 t.p.i., is recommended, though this is not highly important.

The crank disc should be made a neat fit on the lever shaft, where it is secured either by an Allen screw or a taper pin, but this should not be finally fitted until the gear is assembled and its proper location settled. This applies also to the position of the stop pin relative to the lifting pin in the face of the crank disc, particularly if, for any reason, the dimensions or general arrangement of the mounting should be modified. A piece of $\frac{3}{8}$ in. square mild-steel bar is most convenient for making the tension bolt, which is turned down for a length of $1\frac{3}{4}$ in. and screwed to take two $\frac{1}{4}$ in. B.S.F. lock nuts, the exact length of thread depending on the range of adjustment required. It remains only to bend the U-shaped stirrup from $\frac{5}{8}$ in. $\times$ $\frac{1}{8}$ in. strip steel and drill it as shown, to complete the actual disengaging mechanism.



When assembled, the disc crank should be temporarily grub-screwed to the shaft in such a position that the hand lever moves over a convenient range to lift the engine clear of the wheel, and the lifting pin goes slightly over the "dead centre," further movement being prevented by the tension bolt resting against the stop pin. The crank may then be permanently fixed by drilling a deep "dimple" or cutting a flat on the shaft to locate the end of the Allen screw, according to whether the latter is pointed or cup-ended. If the engine is to be pressed down positively on to the tyre, one of the tension bolt lock nuts should be placed inside the stirrup and the other outside, but otherwise, both should be inside.

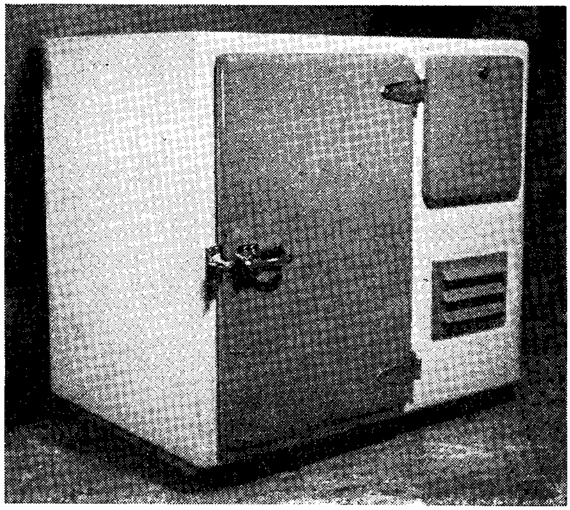
If tension springs are used to hold the engine down, as recommended, the clips for anchoring the lower ends of the springs should be made to fit the section of the rear stay tubes; as these vary widely in different makes of cycles, it is impossible to specify standard dimensions. One might dispense with these clips, and anchor the springs from the rear spindle or the mudguard stays, but apart from unnecessary length of linkage in this case, and general obtrusiveness, fitting the clips has the advantage that it enables the spring tension readily to be varied if required.

I should, perhaps, have mentioned, before dealing with the mounting arrangements, that it is necessary to cut a section out of the rear mudguard to enable the friction roller to work on the tyre, though I trust this will be quite obvious to most readers. The rear part of the mudguard, when refitted, will require an additional stay, especially in view of the fact that it will also have to carry a number plate which, in this country at least, is required by law. It should hardly be necessary for me to describe in detail the operations involved here, which again are subject to the exact design of the cycle, but readers will undoubtedly be quite competent to work them out for themselves.

(To be continued)

Another Refrigerator

by F. H. Gray



Closed for business !

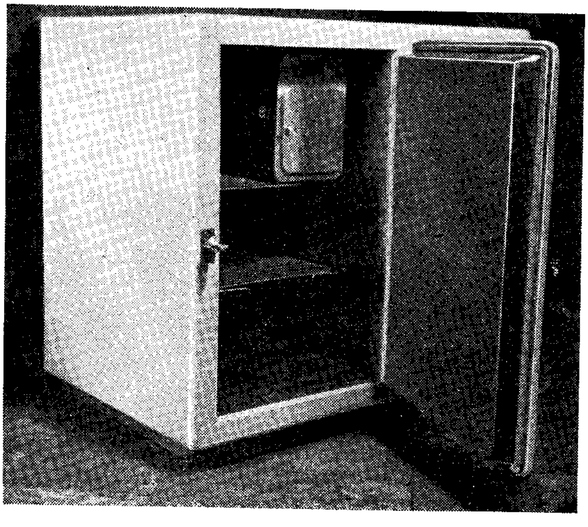
WHEN Mr. Sherrell's articles on building a refrigerator were published, I was very interested, but on going into the matter and considering the equipment at my disposal, I decided that the job was too big for me to tackle. Some time afterwards, I was in a fellow club-member's workshop and saw in a corner, a somewhat delapidated 'frig compressor, and after examining it, persuaded the owner to part with it. On stripping it down, it was found to be in good mechanical condition although the disc valves were so rusted that they broke into pieces as soon as they were touched. The compressor is a very old one with the eccentric type big-end, and was originally fitted with a shaft seal, shaped like a washer with a raised centre boss. This was apparently pressed against the end cover of the seal housing by a spring-loaded ball at the other end of the crankshaft. The shaft, incidentally, is hardened and ground, and runs in the cast-iron crankcase. There is no perceptible play in these bearings, which speaks well for the original precision fitting.

I decided to modify the housing to accommodate a modern type shaft seal, as shown in Mr. Sherrell's article. This new housing can be seen in one of the photographs. The addition of this housing meant that the fly-wheel could not be secured by the original cotter-bolt, so the fly-wheel was reversed, and is held to the shaft by a $\frac{5}{16}$-in. B.S.F. Allen screw. So far, it has held satisfactorily.

The Easy Way

I tried my hand at bending $\frac{3}{8}$ in. diameter 20-gauge copper tube, but spoilt more bends than I could afford, and so I invested in a commercially made condenser. It cost only a few shillings more than the copper tubing and material to make one, and was also heavily tinned. I might have got more fun from making a compressor and condenser, but my spare time is limited, so I took the easy way. I had more luck with the evaporator, which is made from 22-gauge Monel metal with 20 ft. of $\frac{3}{8}$ in. diameter tubing wound on, and sweated all over. I was lucky enough to obtain some second-hand eleven-ply panels and the cabinet is made from these.

The top-right hand door encloses a small galvanised bin for vegetables. It is not part of the cold cabinet, and was only included to avoid wasting space. It is insulated from the heat of the motor and compressor by a fibre board. The shape of the cabinet was dictated by kitchen space considerations. The inner cabinet is made from 20-gauge aluminium, and apart from having to remove it several times to drill the necessary holes, was fairly easy to make. I experienced some difficulty in packing in the fibre glass insulation, due to the fact that there are no detachable panels, and all the packing had to be don



Showing the inner cabinet and door insulation

from the back. This fibre glass is bitumenised, and was purchased from a firm which specialises in supplying caravan equipment. It was obtained in a roll, 12 yd. by 3 ft. 6 in. and is 1 in. thick.

The unit is charged with $1\frac{1}{4}$ lb. of methyl chloride, obtained from a most obliging local refrigerator manufacturer. For this, I used an ex-R.A.F. fire extinguisher in which I fitted a shut-off valve.

The liquid receiver is also a smaller version of the R.A.F. extinguisher, and is just the right size. I found that mounting the unit on a wooden baseboard tended to amplify the noise of the motor, so a mounting was built up from angle iron. The whole mounting stands on rubber blocks and is now practically inaudible.

An Initial Error

My first big mistake was in running the unit and letting it pump air, as this resulted in condensation forming in the system and gave me a lot of trouble. This moisture persisted in freezing at the expansion valve, although a silica gel drier was permanently connected in the circuit. It was not until I dismantled the drier and baked it thoroughly that the trouble was overcome. When the refrigerator had been in use for about a week, I decided to give it a final coat of paint and the unit was stopped. During the paint-drying period a very slight hissing noise was heard, much to my disgust, and after a lot of testing with soap and water, it was found that the shaft seal was leaking and nothing that I did could persuade it to behave. I came to the conclusion that a new one was necessary, and since fitting it have had no further trouble. I can thoroughly recommend intending constructors to carry out Mr. Sherrell's pressure-testing procedure, as time spent on this will be amply repaid.

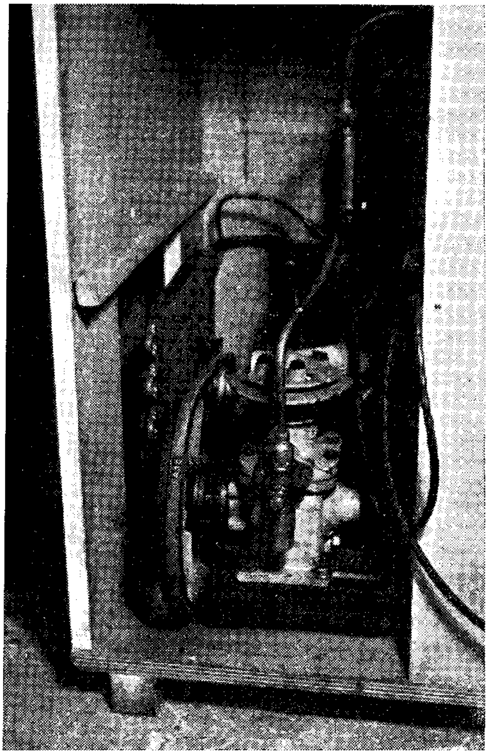
My Tiny Finger is Frozen

During the testing of my unit, I was able to maintain a 20 in. vacuum, and found that the compound gauge gave instant warning of any trouble. It was left in the circuit during the initial running-up of the unit. With the expansion valve set to give a reading of 8 lb. and the thermostat at normal, the running time is approximately 3 min. on 20 min. off. I believe this compares favourably with the commercial jobs. Whilst purging the charging line of air, the shut-off valve on the gas bottle, was accidentally opened rather quickly and the gas sprayed on one of my fingers, which became partly frozen and was very painful. Although no harm resulted from this, I mention it as a warning to others. It surprised me, I can tell you! The three valves are, of course, used to close parts of the system so that the refrigerator can be pumped out in order to carry out service work or repairs. For example, if the compressor should need attention, the liquid receiver valve is closed, and the unit is run until a 20 in. vacuum is shown on the compound gauge, this being connected to the suction valve.

The discharge and suction valves are then closed and unbolted from the compressor, thus enabling the compressor to be removed. The air in the compressor must be evacuated before these valves are opened again after they are bolted on, and this is done by removing the service plug on the discharge valve and running the compressor until a 15-in. vacuum is obtained.

Since the photographs were taken, a vee groove flywheel has been fitted, as the vee belt tended to slip on the flat face of the original flywheel.

The whole job has been very interesting and certainly well worth while from a domestic point of view, the domestic half of the family having been very quiet since its completion.



Showing modification to crankcase

The total cost was just under £18, and, for a 4 cu. ft. refrigerator, this shows an immense saving against the commercial article.

My thanks are due to Mr. Biffin of the Kent Model Engineering Society for his excellent photographs.

CORRECTION

We have been asked to advise readers that the prices of the "Selecta" grinders advertised in last week's issue by B. Elliott & Co. Ltd., Willesden, should be as follows:

$4\frac{1}{2}$ in. model £7 19s.; 6 in. model £15 19s.; 7 in. model £19 5s.; 8 in. model £26 5s.; 10 in. model £36 6s.; 10 in. model 22s. extra for single-phase.

PRACTICAL LETTERS

Gas Turbines

DEAR SIR,—With regard to the engine mentioned in THE MODEL ENGINEER "Smoke Ring," in July 12th issue, I have in my possession a set of six volumes of *Modern Engines and Power Generators*, published by The Caxton Press, *circa* 1904-05, in which there is a description of an internal combustion turbine, known as Ferranti's Hot Gas Turbine. The article gives a description of this machine, and a drawing. It states that the patent specification is number 2565, 1895, and that it proposes what Mr. Parsons had proposed in his original patent—it would seem from this that Mr. Parsons could be claimed as an originator of this type of engine. This engine drew its fuel from a producer gas plant.

Then followed a description of another type of gas combustion turbine, complete with drawing, which to my mind (I am not a professional engineer) seems very much on the lines of the modern gas turbine. From the wording of the text, it appears that the author of the books, Rankin Kennedy, had made experiments with this type of machine.

Yours faithfully,
Newton Abbot. MARTIN WM. BOWDEN STOREY

Camera Construction

DEAR SIR,—I have appreciated these articles but feel that so far they are incomplete. What I feel is needed is more general information about optics, shutter design and construction. Many amateurs, I feel, could make the casing but are hazy about lens and shutters. Given guidance on these points, it should be possible for the amateur to make the camera of his choice, whether it be whole-plate, or, as is my fancy a single lens, reflex of $2\frac{1}{4} \times 2\frac{1}{4}$.

Yours faithfully,
Ruislip. H. L. CRUTTENDEN.

DEAR SIR,—I was pleased to see Mr. H. Arthur Clues' article describing his press camera and congratulate him on what appears to be a first class job. I am interested in focal plane shutters, as I expect other budding camera builders are, and an article by Mr. Clues on how he made and designed his shutter would be very much appreciated. Any information by any of our readers on this subject would be welcomed, as few of us have had the opportunity of examining the mechanism of a focal plane shutter.

Yours faithfully,
Belfast. J. W. MCCLELLAND.

Francis Thompson

DEAR SIR,—I have just seen your paragraph under "Smoke Rings" in THE MODEL ENGINEER dated June 28th, appealing for a portrait of Francis Thompson, and further information on his life and work. I hope your appeal will be successful and shall be interested to know the result. I am in personal contact with my friends Dr. A. P. Thurston and Mr. Frank Nixon, on the subject.

The point of this letter, however, is to correct two mistakes which are unfortunately printed in your paragraph, viz. :—

(1) The atmospheric engine was first erected at Oakerthorpe Colliery, near Measham, Derbyshire. (I have never heard of Askerthorpe Colliery.)

(2) The correct reference is to The Transactions of the Institution of Mining Engineers, Vol. 52, Part 2. Pages 396 to 420 and 423 to 445. The latter pages contain the discussion on the paper by Mr. W. T. Anderson. (There is no publication called Transaction of Mining Engineering.)

Yours faithfully,
The Science Museum, S.W.7. A. STOWERS.
Keeper,
Department of Motive Power and Industries.

Steel Boilers

DEAR SIR,—It was with very great interest that I read in the August 2nd issue of ours, the article by Mr. Austen-Walton, on what to use in place of copper for boiler construction.

In his final summing up he seems to favour stainless-steel, but from my experience of this he seems to have overlooked a point that I think would be of interest.

If a forging is made in stainless-steel, or if heat has been applied to scale the surface and it is left like that, it will rust much quicker than mild-steel.

To keep its rustless properties, it has either to be burnished bright or de-scaled by pickling, and the only pickle that would do the job was known as "Picklit" supplied by Firths.

My interest in this subject is that in 1936 I built a $1\frac{1}{4}$-in. traction engine and owing to the lack of the needful, copper was out of the question. Either I did without an engine or I made one with a steel boiler.

The barrel was a piece of steam pipe $3\frac{1}{2}$ in. diameter whilst the rest was made from $\frac{1}{8}$-in. mild-steel plate, the lot being oxy-welded.

The engine stood throughout the war and has been steamed on every occasion since, and on inspection through the drain plug and filler holes there seems to be no sign of the deep pitting to which Mr. Austen-Walton refers.

On looking through some back numbers (a favourite pastime) the other day, I came across an article on a model tug with a coal-fired boiler made from steel. The writer stated he constructed this with 18 and 20 gauge only; it would be interesting to learn if he still has the tug in one piece after a season's running.

Many thanks for the countless hours of pleasure and instruction which have come through the pages of THE MODEL ENGINEER.

Yours truly,
Stourport-on-Severn. G. W. CHITTOCK.